#332

S-CUBED

CONDENSED EXPERIMENTER DATA

71-096A-01A, 2A, 3A, 4A, 5A, 6A + 7A

S-CUBED

COMMON CONDENSED EXPERIMENTER TAPES

71-096A-01A - 07A

THIS DATA SET HAS BEEN RESTORED. ORIGINALLY THERE WERE 293 7-TRACK, 800 BPI TAPES, WRITTEN IN BINARY. FORTY-SEVEN OF THESE ORIGINAL TAPES WERE NOT RESTORED DUE TO THE TAPES BEING BAD. THESE TAPES ARE LISTED LATER ON. THERE ARE 28 RESTORED TAPES. THE DR TAPES ARE 3480 CARTRIDGES AND THE DS TAPES ARE 9-TRACK, 6250 BPI. THE ORIGINAL TAPES WERE CREATED ON AN IBM 360 COMPUTER AND THEY WERE RESTORED ON THE MODCOMP COMPUTER. THE DR AND DS NUMBERS ALONG WITH THE CORRESPONDING D NUMBERS AND THE TIME SPANS ARE AS FOLLOWS:

DR#	DS#	D#	FILES	TIME SPAN	
DR004938	DS004938	D022664	1-10	11/15/71 - 11/16/71	
		D022665	11-21	11/17/71 - 11/18/71	
		D022666	22-34	11/18/71 - 11/19/71	
		D022667	35-45	11/20/71 - 11/21/71	(a)
		D022668	46-59	11/21/71 - 11/23/71	
		D022669	60-72	11/23/71 - 11/24/71	
		D022670	73-82	11/25/71 - 11/25/71	(b)
		D022671	83-92	11/26/71 - 11/28/71	
		D022672	93-104	11/28/71 - 11/29/71	
DR004939	DS004939	D022673	1-12	11/30/71 - 12/01/71	
		D022674	13-25	12/01/71 - 12/01/71	
		D022675	26-38	12/03/71 - 12/04/71	
		D022676	39-48	12/04/71 - 12/06/71	(c)
		D022677	49-60	12/04/71 - 12/07/71	
		D022678	61-71	12/08/71 - 12/09/71	(d)
		D022679	72-81	12/09/71 - 12/11/71	
		D022680	82-91	12/11/71 - 12/12/71	
		D022681	92-101	12/13/71 - 12/14/71	
DR004940	DS004940	D022682	1-10	12/14/71 - 12/15/71	
		D022683	11-20	12/16/71 - 12/17/71	
		D022684	21-30	12/17/71 - 12/19/71	
		D022685	31-40	12/19/71 - 12/20/71	
		D022686	41-50	12/21/71 - 12/22/71	(e)
		D022687	51-60	12/24/71 - 12/25/71	
		D022688	61-70	12/26/71 - 12/27/71	(f)
		D022689	71-80	12/27/71 - 12/28/71	
		D022690	81-90	12/29/71 - 12/30/71	

DR#	DS#	D#	FILES	TIME SPAN	
DR004941	DS004941	D022691	1-10	12/30/71 - 01/01/72	
		D022692	11-20	01/01/72 - 01/02/72	
		D022693	21-32	01/02/72 - 01/04/72	
		D022694	33-42	01/04/72 - 01/05/72	(g)
		D022695	43-52	01/06/72 - 01/07/72	
		D022696	53-63	01/07/72 - 01/09/72	
		D022697	64-73	01/09/72 - 01/10/72	(h)
		D022698	74-83	01/11/72 - 01/12/72	(i)
		D022699	84-93	01/12/72 - 01/14/72	
DR004942	DS004942	D022700	1-10	01/14/72 - 01/15/72	(j)
		D022701	11-20	01/15/72 - 01/17/72	(k)
		D022702	21-32	01/17/72 - 01/18/72	(l)
		D022703	33-42	01/19/72 - 01/20/72	
		D022704	43-52	01/20/72 - 01/22/72	(m)
		D022705	53-62	01/22/72 - 01/23/72	
		D022706	63-72	01/24/72 - 01/25/72	
		D022707	73-82	01/25/72 - 01/26/72	
		D022708	83-92	01/27/72 - 01/28/72	
DR004943	DS004943	D022709	1-10	01/28/72 - 01/30/72	
		D022710	11-20	01/30/72 - 01/31/72	
		D022711	21-30	02/01/72 - 02/02/72	
		D022712	31-42	02/02/72 - 02/03/72	
		D022713	43-52	02/05/72 - 02/07/72	(n)
		D022714	53-62	02/07/72 - 02/08/72	(o)
		D022715	63-72	02/09/72 - 02/10/72	
		D022716	73-82	02/10/72 - 02/12/72	
		D022717	83-92	02/12/72 - 02/12/72	(p)
DR004944	DS004944	D022718	1-11	02/13/72 - 02/15/72	(q)
		D022719	12-21	02/15/72 - 02/16/72	
		D022720	22-31	02/17/72 - 02/18/72	
		D022721	32-41	02/18/72 - 02/20/72	
		D022722	42-51	02/20/72 - 02/21/72	
		D022723	52-61	02/22/72 - 02/23/72	
		D022724	62-71	02/23/72 - 02/24/72	
		D022725	72-81	02/26/72 - 02/26/72	
		D022726	82-91	02/26/72 - 02/28/72	
DR004945	DS004945	D022727	1-10	02/28/72 - 02/29/72	
		D022728	11-20	03/01/72 - 03/02/72	(r)
		D022729	21-30	03/02/72 - 03/03/72	
		D022730	31-40	03/04/72 - 03/05/72	
		D022731	41-50	03/05/72 - 03/07/72	(s)
		D022732	51-60	03/07/72 - 03/08/72	
		D022733	61-71	03/09/72 - 03/10/72	
		D022734	72-81	03/10/72 - 03/12/72	
		D022735	82-91	03/12/72 - 03/13/72	(t)

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DR#	DS#	D#	FILES	TIME SPAN	
DR004946	DS004946	D022736	1-10	03/13/72 - 03/15/72	
		D022737	11-20	03/15/72 - 03/16/72	
		D022738	21-30	03/17/72 - 03/18/72	
		D022739	31-40	03/18/72 - 03/20/72	
		D022740	41-50	03/20/72 - 03/21/72	
		D022741	51-60	03/21/72 - 03/23/72	
		D022742	61-71	03/23/72 - 03/24/72	
		D022743	72-81	03/25/72 - 03/26/72	
		D022744	82-91	03/26/72 - 03/28/72	(u)
DR004947	DS004947	D022745	1-10	03/28/72 - 03/29/72	(v)
		D022746	11-21	03/30/72 - 03/31/72	
		D022747	22-31	03/31/72 - 04/01/72	
		D022748	32-41	04/02/72 - 04/03/72	
		D022749	42-54	04/03/72 - 04/05/72	(w)
		D022750	55-65	04/06/72 - 04/08/72	
		D022751	66-75	04/08/72 - 04/08/72	
		D022752	76-86	04/10/72 - 04/11/72	
		D022753	87-96	04/11/72 - 04/13/72	(x)
DR004948	DS004948	D022754	1-11	04/13/72 - 04/14/72	(y)
		D022755	12-21	04/15/72 - 04/16/72	
		D022756	22-32	04/16/72 - 04/17/72	
		D022757	33-44	04/18/72 - 04/19/72	(z)
		D022758	45-54	04/21/72 - 04/22/72	
		D022759	55-64	04/23/72 - 04/24/72	
		D022760	65-74	04/24/72 - 04/25/72	
		D022761	75-84	04/26/72 - 04/27/72	
		D022762	85-94	04/29/72 - 04/30/72	
DR004949	DS004949	D022763	1-10	05/01/72 - 05/02/72	
		D022764	11-13	05/02/72 - 05/04/72	
		D022765	14-26	05/04/72 - 05/05/72	
		D022766	27-36	05/05/72 - 05/07/72	
		D022767	37-46	05/07/72 - 05/08/72	
		D022768	47-56	05/09/72 - 05/10/72	
		D022769	57-68	05/10/72 - 05/11/72	
		D022770	69-78	05/12/72 - 05/13/72	(aa)
		D022771	79-88	05/13/72 - 05/15/72	
DR004950	DS004950	D022772	1-13	05/15/72 - 05/16/72	(bb)
		D022773	14-24	05/16/72 - 05/18/72	(cc)
		D022774	25-38	05/18/72 - 05/20/72	
		D022775	39-48	05/20/72 - 05/21/72	
		D022776	49-59	05/21/72 - 05/23/72	
		D022777	60-66	05/23/72 - 05/24/72	
		D022778	67-76	05/25/72 - 05/26/72	
		D022779	77-86	05/26/72 - 05/28/72	
		D022780	87-92	05/28/72 - 05/28/72	
		D022781	93-99	05/29/72 - 05/30/72	

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DR#	DS#	D#	FILES	TIME SPAN	
DR004951	DS004951	D022782	1-9	05/31/72 - 06/01/72	
		D022783	10-20	06/01/72 - 06/03/72	(dd)
		D022784	21-30	06/03/72 - 06/05/72	
		D022785	31-42	06/05/72 - 06/06/72	(ee)
		D022786	43-52	06/06/72 - 06/07/72	
		D022787	53-54	06/08/72 - 06/08/72	(ff)
		D022791	55-64	06/16/72 - 06/17/72	
		D022792	65-77	06/17/72 - 06/19/72	
		D022794	78-88	06/21/72 - 06/22/72	
		D022795	89-98	06/22/72 - 06/24/72	
DR004952	DS004952	D022797	1-11	06/26/72 - 06/27/72	
		D022915	12-21	06/30/72 - 07/02/72	
		D022916	22-31	07/02/72 - 07/03/72	
		D022918	32-41	07/07/72 - 07/08/72	
		D022920	42-51	07/10/72 - 07/12/72	
		D022921	52-61	07/13/72 - 07/15/72	
		D022923	62-71	07/16/72 - 07/17/72	
		D022924	72-83	07/18/72 - 07/19/72	
DR004953	DS004953	D022925	1-10	07/20/72 - 07/21/72	
		D022926	11-20	07/21/72 - 07/23/72	
		D022927	21-30	07/23/72 - 07/24/72	(gg)
		D022928	31-42	07/24/72 - 07/26/72	
		D022929	43-53	07/26/72 - 07/27/72	
		D022930	54-63	07/28/72 - 07/29/72	
		D022931	64-73	07/29/72 - 07/30/72	
DR004954	DS004954	D022932	1-10	07/31/72 - 08/01/72	
		D022933	11-20	08/01/72 - 08/03/72	
		D022934	21-31	08/03/72 - 08/04/72	
		D022935	32-44	08/05/72 - 08/06/72	(hh)
		D022936	45-54	08/06/72 - 08/07/72	
		D022938	55-66	08/09/72 - 08/11/72	
		D022939	67-77	08/11/72 - 08/12/72	
		D022941	78-87	08/14/72 - 08/15/72	
		D022942	88-98	08/16/72 - 08/17/72	
DR004955	DS004955	D022944	1-11	08/21/72 - 08/22/72	
		D022945	12-22	08/22/72 - 08/23/72	
		D022946	23-32	08/24/72 - 08/25/72	
		D022947	33-42	08/25/72 - 08/27/72	
		D022948	43-52	08/27/72 - 08/28/72	
		D022949	53-62	08/30/72 - 08/31/72	
		D022951	63-72	09/02/72 - 09/04/72	
		D022952	73-82	09/04/72 - 09/05/72	
		D022953	83-94	09/05/72 - 09/07/72	(ii)

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DR#	DS#	D#	FILES	TIME SPAN
DR004956	DS004956	D022955	1-11	09/07/72 - 09/10/72
		D022957	12-23	09/12/72 - 09/13/72 (jj)
		D022958	24-34	09/13/72 - 09/15/72
		D023039	35-44	09/15/72 - 09/16/72
		D023040	45-54	09/17/72 - 09/18/72
		D023041	55-65	09/18/72 - 09/20/72
		D023042	66-76	09/20/72 - 09/21/72
		D023043	77-86	09/21/72 - 09/23/72 (kk)
		D023045	87-97	09/25/72 - 09/26/72
DR004957	DS004957	D023046	1-10	09/26/72 - 09/27/72 (ll)
		D023047	11-20	09/28/72 - 09/29/72
		D023050	21-31	10/02/72 - 10/04/72
		D023051	32-41	10/04/72 - 10/05/72
		D023052	42-51	10/06/72 - 10/07/72
DR004958	DS004958	D023054	1-10	10/07/72 - 10/09/72
		D023055	11-20	10/10/72 - 10/12/72
		D023056	21-30	10/12/72 - 10/13/72
		D023057	31-40	10/14/72 - 10/15/72
		D023059	41-51	10/18/72 - 10/20/72
		D023061	52-62	10/20/72 - 10/23/72
		D023063	63-73	10/24/72 - 10/26/72
		D023064	74-84	10/26/72 - 10/28/72
		D023065	85-94	10/29/72 - 10/31/72
		D023066	95-104	10/31/72 - 11/01/72
DR004959	DS004959	D023068	1-8	11/02/72 - 11/03/72
		D023076	9-19	11/14/72 - 11/15/72
		D023077	20-29	11/16/72 - 11/17/72
		D023078	30-40	11/17/72 - 11/19/72
		D023079	41-50	11/19/72 - 11/20/72
		D023080	51-60	11/20/72 - 11/22/72
		D023081	61-70	11/22/72 - 11/23/72
		D023082	71-82	11/24/72 - 11/25/72
		D023084	83-97	11/27/72 - 11/28/72
DR004960	DS004960	D023085	1-13	11/28/72 - 11/30/72
		D023086	14-23	11/30/72 - 12/01/72
		D023087	24-35	12/01/72 - 12/03/72
		D023088	36-45	12/03/72 - 12/04/72
		D023089	46-56	12/05/72 - 12/06/72
		D023092	57-66	12/09/72 - 12/10/72
		D023094	67-78	12/12/72 - 12/14/72
		D023095	79-88	12/14/72 - 12/15/72
		D023096	89-100	12/15/72 - 12/17/72

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DR#	DS#	D#	FILES	TIME SPAN	
DR004961	DS004961	D023098	1-13	12/20/72 - 12/21/72	
		D023099	14-25	12/21/72 - 12/23/72	
		D023100	26-35	12/23/72 - 12/24/72	
		D023101	36-45	12/25/72 - 12/26/72	
		D023102	46-56	12/28/72 - 12/29/72	
		D023103	57-67	12/29/72 - 12/31/72	
		D023104	68-77	12/31/72 - 01/01/73	
		D023105	78-87	01/01/73 - 01/03/73	
		D023106	88-99	01/03/73 - 01/04/73	
DR004962	DS004962	D023107	1-11	01/05/73 - 01/06/73	(mm)
		D023109	12-22	01/08/73 - 01/09/73	
		D023111	23-34	01/11/73 - 01/12/73	
		D023112	35-46	01/12/73 - 01/14/73	
		D023113	47-56	01/14/73 - 01/15/73	
		D023114	57-69	01/15/73 - 01/17/73	
		D023115	70-81	01/17/73 - 01/18/73	
		D023116	82-94	01/19/73 - 01/20/73	
		D023117	95-102	01/20/73 - 01/21/73	(nn)
DR004963	DS004963	D023118	1-10	01/22/73 - 01/23/73	
		D023119	11-22	01/23/73 - 01/24/73	
		D023120	23-33	01/24/73 - 01/26/73	
		D023122	34-44	01/26/73 - 01/29/73	
		D023123	45-54	01/29/73 - 01/30/73	(oo)
		D023124	55-66	01/31/73 - 02/01/73	
		D023125	67-78	02/01/73 - 02/02/73	
		D023127	79-89	02/06/73 - 02/07/73	
		D023128	90-99	02/07/73 - 02/08/73	
DR004964	DS004964	D023129	1-12	02/09/73 - 02/10/73	
		D023130	13-23	02/10/73 - 02/12/73	
		D023131	24-35	02/12/73 - 02/13/73	
		D023132	36-47	02/14/73 - 02/15/73	
		D023133	48-59	02/15/73 - 02/16/73	
		D023137	60-70	02/23/73 - 02/24/73	
		D023138	71-82	02/24/73 - 02/26/73	(pp)
		D023140	83-92	03/01/73 - 03/02/73	
		D023141	93-103	03/02/73 - 03/04/73	
DR004965	DS004965	D023142	1-10	03/04/73 - 03/05/73	
		D023322	11-20	12/21/72 - 12/23/72	
		D023323	21-30	04/20/72 - 04/21/72	
		D023325	31-43	07/03/72 - 07/05/72	
		D023326	44-55	07/11/72 - 07/13/72	
		D023328	56-65	02/04/73 - 02/06/73	

EAD ERRORS OCCURRED ON THE FOLLOWING TAPES:

(a) D022667 - 7 ERRORS, REC. 22, 25, 37, 39, 42, 44, 73, FILE 4
b) D022670 - 1 ERROR, REC. 256, FILE 4
(c) D022676 - 1 ERROR, REC. 6, FILE 10
(d) D022678 - 1 ERROR, REC. 6, FILE 11
(e) D022686 - 2 ERRORS, REC. 168, 295, FILE 2
(f) D022688 - 1 ERROR, REC. 88, FILE 2
(g) D022694 - 1 ERROR, REC. 238, FILE 2
(h) D022697 - 1 ERROR, REC. 225, FILE 10
(i) D022698 - 1 ERROR, REC. 183, FILE 2
(j) D022700 - 1 ERROR, REC. 352, FILE 10
(k) D022701 - 3 ERRORS, REC. 327, FILE 6; REC. 216, FILE 8; REC. 205, FILE 10
(l) D022702 - 1 ERROR, REC. 341, FILE 12
(m) D022704 - 2 ERRORS, REC. 3, FILE 2; REC. 331, FILE 5
(n) D022713 - 1 ERROR, REC. 2, FILE 2
(o) D022714 - 1 ERROR, REC. 127, FILE 6
(p) D022717 - 1 ERROR, REC. 2, FILE 10
(q) D022718 - 2 ERRORS, REC. 3, FILE 2; REC. 2, FILE 11
(r) D022728 - 1 ERROR, REC. 4, FILE 10
(s) D022731 - 5 ERRORS, REC. 288, FILE 2; REC 341 - 344, FILE 10
(t) D022735 - 1 ERROR, REC. 82, FILE 4
(u) D022744 - 1 ERROR, REC. 44, FILE 2
(v) D022745 - 1 ERROR, REC. 180, FILE 8
(w) D022749 - 3 ERRORS, REC. 41, 42, 44, FILE 3
(x) D022753 - 7 ERRORS, REC. 41, 42, 44 - 47, 257, FILE 2
(y) D022754 - 1 ERROR, REC. 88, FILE 2
'z) D022757 - 16 ERRORS, REC. 214 - 217, 219, 228, 230, 232, FILE 2; REC. 37, FILE 7; REC. 21, 41 - 44, 48, 66, FILE 8
(aa) D022770 - 33 ERRORS, REC. 93, 98, 101, 103, 104, 118, 120, 122, 127, 140, 141, 154, FILE 4; REC. 185, 210, 286, 295, 303, 353, FILE 6; REC. 97, 119, 213, 229, 240, 242, 244, 250, 269 - 271, 273, 279, 364, FILE 8; REC. 119, FILE 10
(bb) D022772 - 95 ERRORS, REC. 11, FILE 2; REC. 44, 47, 49, 52 - 54, 59, 61 - 63, 75, 78, 79, 82, 87, 89 - 91, 93, 143, 145, 182, 265, 267, 276, 297, 299, 304, 306, 311, 313, 333, 334, 340, 360, FILE 4; REC. 2, 10, 12, 14, FILE 6; REC. 31, 63, 81, 122, 125, 129, 132, 134, 154, 161, 166, 171, 182, 198, 210, 235, 251, FILE 7; REC. 15, 31, FILE 9; REC. 6, 13, 15, 38, 64, 65, 67, 72, 94, 111, 121, 125, 148, 152, 174, 177, 179, 181, 182, 184, 186, 196, 311, 333, 341, 345, 396, FILE 10; REC. 22, 30, FILE 12; REC. 247, 261, 286, 302, 308, 314, 320, FILE 13
(cc) D022773 - 1 ERROR, REC. 177, FILE 5
(dd) D022783 - 2 ERRORS, REC. 13, 14, FILE 2
(ee) D022785 - 1 ERROR, REC. 176, FILE 2
(ff) D022787 - 1 ERROR, REC. 1, FILE 2
(gg) D022927 - 1 ERROR, REC. 223, FILE 6
(hh) D022935 - 2 ERRORS, REC. 1, FILE 2; REC. 266, FILE 1
(ii) D022953 - 1 ERROR, REC. 90, FILE 5
(jj) D022957 - 1 ERROR, REC. 119, FILE 2
(kk) D023043 - 1 ERROR, REC. 255, FILE 2
(ll) D023046 - 7 ERRORS, REC. 274 - 279, 300, FILE 2
,mm) D023107 - 3 ERRORS, REC. 44 - 46, FILE 2
(nn) D023117 - 1 ERROR, REC. 34, FILE 8
(oo) D023123 - FILE 1 - O RECORDS
(pp) D023138 - 1 ERROR, REC. 4, FILE 2

THE FOLLOWING TAPES WERE BAD:

D022788 - 90, 93, 96
D022913, 14, 17, 19, 22, 37, 40, 43, 50, 54, 56
D023044, 48, 49, 53, 58, 60, 62, 65, 69 - 74, 83, 90, 91, 93, 97
D023108, 10, 21, 26, 34 - 36, 39
D023324, 27, 29, 30

S³ calib. data tape T5152

REQ. AGENT	RAND NO.	ACQ. AGENT
VJP	RC5021	EGS

S-CUBED

CONDENSED EXPERIMENTER DATA

71-096A-01A, 2A, 3A, 4A, 5A, 6A + 7A

This data set catalog consists of 293 S-Cubed Condensed Experimenter data tapes. The tapes are 800 BPI, Bin, 7 track and are Multi-filed. The tapes were created on an IBM 360/75 computer. The original tapes are stored in Bldging 1.

W#	D#	FILES	TIME SPAN
W20001	D-22664	10	11/15/71 - 11/16/71
W20002	D-22665	11	11/16/71 - 11/18/71
W20003	D-22666	13	11/18/71 - 11/19/71
W20004	D-22667	11	11/20/71 - 11/21/71
W20005	D-22668	14	11/21/71 - 11/23/71
W20006	D-22669	13	11/23/71 - 11/24/71
W20007	D-22670	10	11/24/71 - 11/25/71
W20008	D-22671	10	11/26/71 - 11/28/71
W20009	D-22672	12	11/28/71 - 11/29/71
W20010	D-22673	12	11/29/71 - 12/01/71
W20011	D-22674	13	12/01/71 - 12/01/71
W20012	D-22675	13	12/03/71 - 12/04/71
W20013	D-22676	10	12/04/71 - 12/06/71
W20014	D-22677	10	12/06/71 - 12/07/71
W20015	D-22678	11	12/07/71 - 12/09/71
W20016	D-22679	10	12/09/71 - 12/11/71
W20017	D-22680	10	12/11/71 - 12/12/71
W20018	D-22681	10	12/12/71 - 12/14/71
W20019	D-22682	10	12/14/71 - 12/15/71

W2#	D#	FILES	TIME SPAN
W20020	D-22683	10	12/16/71 - 12/17/71
W20021	D-22684	10	12/17/71 - 12/19/71
W20022	D-22685	10	12/19/71 - 12/20/71
W20023	D-22686	10	12/20/71 - 12/22/71
W20024	D-23322	10	12/22/71 - 12/24/71
W20025	D-22687	10	12/24/71 - 12/25/71
W20026	D-22688	10	12/25/71 - 12/27/71
W20027	D-22689	10	12/27/71 - 12/28/71
W20028	D-22690	10	12/28/71 - 12/30/71
W20029	D-22691	10	12/30/71 - 1/01/72
W20030	D-22692	10	1/01/72 - 1/02/72
W20031	D-22693	12	1/02/72 - 1/04/72
W20032	D-22694	10	1/04/72 - 1/05/72
W20033	D-22695	10	1/06/72 - 1/07/72
W20034	D-22696	11	1/07/72 - 1/09/72
W20035	D-22697	10	1/09/72 - 1/10/72
W20036	D-22698	10	1/10/72 - 1/12/72
W20037	D-22699	10	1/12/72 - 1/14/72
W20038	D-22700	10	1/14/72 - 1/15/72
W20039	D-22701	10	1/15/72 - 1/17/72
W20040	D-22702	12	1/17/72 - 1/18/72
W20041	D-22703	10	1/18/72 - 1/20/72
W20042	D-22704	10	1/20/72 - 1/22/72
W20043	D-22705	10	1/22/72 - 1/23/72
W20044	D-22706	10	1/23/72 - 1/25/72
W20045	D-22707	10	1/25/72 - 1/26/72
W20046	D-22708	10	1/26/72 - 1/28/72
W20047	D-22709	10	1/28/72 - 1/30/72

W2#	D#	FILES	TIME SPAN
W20048	D-22710	10	1/30/72 - 1/31/72
W20049	D-22711	10	1/31/72 - 2/02/72
W20050	D-22712	12	2/02/72 - 2/03/72
W20052	D-22713	10	2/05/72 - 2/07/72
W20053	D-22714	10	2/07/72 - 2/08/72
W20054	D-22715	10	2/08/72 - 2/10/72
W20055	D-22716	10	2/10/72 - 2/12/72
W20056	D-22717	10	2/12/72 - 2/12/72
W20057	D-22718	11	2/13/72 - 2/15/72
W20058	D-22719	10	2/15/72 - 2/16/72
W20059	D-22720	10	2/16/72 - 2/18/72
W20060	D-22721	10	2/18/72 - 2/20/72
W20061	D-22722	10	2/20/72 - 2/21/72
W20062	D-22723	10	2/21/72 - 2/23/72
W20063	D-22724	10	2/23/72 - 2/24/72
W20064	D-22725	10	2/24/72 - 2/26/72
W20065	D-22726	10	2/26/72 - 2/28/72
W20066	D-22727	10	2/28/72 - 2/29/72
W20067	D-22728	10	2/29/72 - 3/02/72
W20068	D-22729	10	3/02/72 - 3/03/72
W20069	D-22730	10	3/04/72 - 3/05/72
W20070	D-22731	10	3/05/72 - 3/07/72
W20071	D-22732	10	3/07/72 - 3/08/72
W20072	D-22733	11	3/08/72 - 3/10/72
W20073	D-22734	10	3/10/72 - 3/12/72
W20074	D-22735	10	3/12/72 - 3/13/72
W20075	D-22736	10	3/13/72 - 3/15/72
W20076	D-22737	10	3/15/72 - 3/16/72

W2#	D#	FILES	TIME SPAN
W20077	D-22738	10	3/16/72 - 3/18/72
W20078	D-22739	10	3/18/72 - 3/20/72
W20079	D-22740	10	3/20/72 - 3/21/72
W20080	D-22741	10	3/21/72 - 3/23/72
W20081	D-22742	11	3/23/72 - 3/24/72
W20082	D-22743	10	3/24/72 - 3/26/72
W20083	D-22744	10	3/26/72 - 3/28/72
W20084	D-22745	10	3/28/72 - 3/29/72
W20085	D-22746	11	3/29/72 - 3/31/72
W20086	D-22747	10	3/31/72 - 4/01/72
W20087	D-22748	10	4/01/72 - 4/03/72
W20088	D-22749	13	4/03/72 - 4/05/72
W20090	D-22750	11	4/06/72 - 4/08/72
W20091	D-22751	10	4/08/72 - 4/08/72
W20092	D-22752	11	4/09/72 - 4/11/72
W20093	D-22753	10	4/11/72 - 4/13/72
W20094	D-22754	11	4/13/72 - 4/14/72
W20095	D-22755	10	4/14/72 - 4/16/72
W20096	D-22756	11	4/16/72 - 4/17/72
W20097	D-22757	12	4/18/72 - 4/19/72
W20098	D-23323	10	4/19/72 - 4/21/72
W20099	D-22758	10	4/21/72 - 4/22/72
W20100	D-22759	10	4/22/72 - 4/24/72
W20101	D-22760	10	4/24/72 - 4/25/72
W20102	D-22761	10	4/25/72 - 4/27/72
W20104	D-22762	10	4/29/72 - 4/30/72
W20105	D-22763	10	4/30/72 - 5/02/72
W20106	D-22764	3	5/02/72 - 5/04/72
W20107	D-22765	13	5/04/72 - 5/05/72

W2#	D#	FILES	TIME SPAN
W20108	D-22766	10	5/05/72 - 5/07/72
W20109	D-22767	10	5/07/72 - 5/08/72
W20110	D-22768	10	5/08/72 - 5/10/72
W20111	D-22769	12	5/10/72 - 5/11/72
W20112	D-22770	10	5/12/72 - 5/13/72
W20113	D-22771	10	5/13/72 - 5/15/72
W20114	D-22772	13	5/15/72 - 5/16/72
W20115	D-22773	11	5/16/72 - 5/18/72
W20116	D-22774	14	5/18/72 - 5/20/72
W20117	D-22775	10	5/20/72 - 5/21/72
W20118	D-22776	11	5/21/72 - 5/23/72
W20119	D-22777	7	5/23/72 - 5/24/72
W20120	D-22778	10	5/24/72 - 5/26/72
W20121	D-22779	10	5/26/72 - 5/28/72
W20122	D-22780	6	5/28/72 - 5/28/72
W20123	D-22781	7	5/29/72 - 5/30/72
W20124	D-22782	9	5/30/72 - 6/01/72
W20125	D-22783	11	6/01/72 - 6/03/72
W20126	D-22784	10	6/03/72 - 6/05/72
W20127	D-22785	12	6/05/72 - 6/06/72
W20128	D-22786	10	6/06/72 - 6/07/72
W20129	D-22787	10	6/08/72 - 6/09/72
W20130	D-22788	4	6/09/72 - 6/10/72
W20131	D-22789	9	6/11/72 - 6/13/72
W20132	D-22790	12	6/13/72 - 6/14/72
D-20133	D-23324	11	6/14/72 - 6/16/72
W20134	D-22791	10	6/16/72 - 6/17/72
W20135	D-22792	13	6/17/72 - 6/19/72
W20136	D-22793	12	6/19/72 - 6/21/72

W2#	D#	FILES	TIME SPAN
W20137	D-22794	11	6/21/72 - 6/22/72
W20138	D-22795	10	6/22/72 - 6/24/72
W20139	D-22796	10	6/24/72 - 6/25/72
W20140	D-22797	11	6/25/72 - 6/27/72
W20141	D-22913	12	6/27/72 - 6/29/72
W20142	D-22914	10	6/29/72 - 6/30/72
W20143	D-22915	10	6/30/72 - 7/02/72
W20144	D-22916	10	7/02/72 - 7/03/72
W20145	D-23325	13	7/03/72 - 7/05/72
W20146	D-22917	11	7/05/72 - 7/07/72
W20147	D-22918	10	7/07/72 - 7/08/72
W20148	D-22919	10	7/08/72 - 7/10/72
W20149	D-22920	11	7/10/72 - 7/11/72
W20150	D-23326	12	7/11/72 - 7/13/72
W20151	D-22921	10	7/13/72 - 7/15/72
W20152	D-22922	10	7/15/72 - 7/16/72
W20153	D-22923	11	7/16/72 - 7/18/72
W20154	D-22924	12	7/18/72 - 7/19/72
W20155	D-22925	10	7/19/72 - 7/21/72
W20156	D-22926	10	7/21/72 - 7/23/72
W20157	D-22927	10	7/23/72 - 7/24/72
W20158	D-22928	12	7/24/72 - 7/26/72
W20159	D-22929	11	7/26/72 - 7/27/72
W20160	D-22930	10	7/27/72 - 7/29/72
W20161	D-22931	10	7/29/72 - 7/30/72
W20162	D-22932	10	7/31/72 - 8/01/72
W20163	D-22933	10	8/01/72 - 8/03/72
W20164	D-22934	11	8/03/72 - 8/04/72
W20165	D-22935	13	8/04/72 - 8/06/72

W2#	D#	FILES	TIME SPAN
W20166	D-22936	10	8/06/72 - 8/07/72
W20167	D-22937	11	8/08/72 - 8/09/72
W20168	D-22938	12	8/09/72 - 8/11/72
W20169	D-22939	11	8/11/72 - 8/12/72
W20170	D-22940	10	8/12/72 - 8/14/72
W20171	D-22941	10	8/14/72 - 8/15/72
W20172	D-22942	11	8/15/72 - 8/17/72
W20173	D-22943	12	8/17/72 - 8/19/72
W20175	D-22944	11	8/20/72 - 8/22/72
W20176	D-22945	11	8/22/72 - 8/23/72
W20177	D-22946	11	8/23/72 - 8/25/72
W20178	D-22947	10	8/25/72 - 8/27/72
W20179	D-22948	10	8/27/72 - 8/28/72
W20181	D-22949	10	8/30/72 - 8/31/72
W20182	D-22950	12	8/31/72 - 9/02/72
W20183	D-22951	10	9/02/72 - 9/04/72
W20184	D-22952	10	9/04/72 - 9/05/72
W20185	D-22953	12	9/05/72 - 9/07/72
W20186	D-22954	10	9/07/72 - 9/08/72
W20187	D-22955	10	9/08/72 - 9/10/72
W20188	D-22956	11	9/10/72 - 9/12/72
W20189	D-22957	12	9/12/72 - 9/13/72
W20190	D-22958	11	9/13/72 - 9/15/72
W20191	D-23039	10	9/15/72 - 9/16/72
W20192	D-23040	10	9/16/72 - 9/18/72
W20193	D-23041	11	9/18/72 - 9/20/72
W20194	D-23042	11	9/20/72 - 9/21/72
W20195	D-23043	10	9/21/72 - 9/23/72
W20196	D-23044	10	9/23/72 - 9/24/72

W2#	D#	FILES	TIME SPAN
W20197	D-23045	11	9/24/72 - 9/26/72
W20198	D-23046	10	9/26/72 - 9/27/72
W20199	D-23047	10	9/27/72 - 9/29/72
W20200	D-23048	10	9/29/72 - 10/01/72
W20201	D-23049	10	10/01/72 - 10/02/72
W20202	D-23050	11	10/02/72 - 10/04/72
W20203	D-23051	10	10/04/72 - 10/05/72
W20204	D-23052	10	10/05/72 - 10/07/72
W20205	D-23053	10	10/07/72 - 10/09/72
W20206	D-23054	10	10/09/72 - 10/10/72
W20207	D-23055	10	10/10/72 - 10/12/72
W20208	D-23056	10	10/12/72 - 10/13/72
W20209	D-23057	10	10/13/72 - 10/15/72
W20211	D-23058	11	10/17/72 - 10/18/72
W20212	D-23059	11	10/18/72 - 10/20/72
W20213	D-23060	11	10/20/72 - 10/21/72
W20214	D-23061	10	10/21/72 - 10/23/72
W20215	D-23062	10	10/23/72 - 10/24/72
W20216	D-23063	12	10/24/72 - 10/26/72
W20217	D-23064	11	10/26/72 - 10/28/72
W20218	D-23065	10	10/28/72 - 10/29/72
W20219	D-23066	10	10/29/72 - 10/31/72
W20220	D-23067	10	10/31/72 - 11/01/72
W20221	D-23068	8	11/01/72 - 11/03/72
W20222	D-23069	10	11/03/72 - 11/04/72
W20223	D-23070	10	11/04/72 - 11/06/72
W20224	D-23071	11	11/06/72 - 11/08/72
W20225	D-23072	11	11/08/72 - 11/09/72
W20226	D-23073	2	11/10/72 - 11/10/72

W2#	D#	FILES	TIME SPAN
W20227	D-23074	10	11/11/72 - 11/12/72
W20228	D-23075	10	11/12/72 - 11/14/72
W20229	D-23076	11	11/14/72 - 11/15/72
W20230	D-23077	10	11/15/72 - 11/17/72
W20231	D-23078	11	11/17/72 - 11/19/72
W20232	D-23079	10	11/19/72 - 11/20/72
W20233	D-23080	10	11/20/72 - 11/22/72
W20234	D-23081	10	11/22/72 - 11/23/72
W20235	D-23082	12	11/23/72 - 11/25/72
W20236	D-23083	10	11/25/72 - 11/26/72
W20237	D-23084	15	11/26/72 - 11/28/72
W20238	D-23085	13	11/28/72 - 11/30/72
W20239	D-23086	10	11/30/72 - 12/01/72
W20240	D-23087	12	12/01/72 - 12/03/72
W20241	D-23088	10	12/03/72 - 12/04/72
W20242	D-23089	11	12/04/72 - 12/06/72
W20243	D-23090	12	12/06/72 - 12/07/72
W20244	D-23091	11	12/07/72 - 12/09/72
W20245	D-23092	10	12/09/72 - 12/10/72
W20246	D-23093	10	12/10/72 - 12/12/72
W20247	D-23094	12	12/12/72 - 12/14/72
W20248	D-23095	10	12/14/72 - 12/15/72
W20249	D-23096	12	12/15/72 - 12/17/72
W20250	D-23327	10	12/17/72 - 12/18/72
W20251	D-23097	11	12/18/72 - 12/20/72
W20252	D-23098	13	12/20/72 - 12/21/72
W20253	D-23099	12	12/21/72 - 12/23/72
W20254	D-23100	10	12/23/72 - 12/24/72
W20255	D-23101	10	12/24/72 - 12/26/72

W2#	D#	FILES	TIME SPAN
W20257	D-23102	11	12/28/72 - 12/29/72
W20258	D-23103	11	12/29/72 - 12/31/72
W20259	D-23104	10	12/31/72 - 1/01/73
W20260	D-23105	10	1/01/73 - 1/03/73
W20261	D-23106	12	1/02/73 - 1/04/73
W20262	D-23107	11	1/04/73 - 1/06/73
W20263	D-23108	11	1/06/73 - 1/07/73
W20264	D-23109	11	1/07/73 - 1/09/73
W20265	D-23110	11	1/09/73 - 1/10/73
W20266	D-23111	12	1/11/73 - 1/12/73
W20267	D-23112	12	1/12/73 - 1/14/73
W20268	D-23113	10	1/14/73 - 1/15/73
W20269	D-23114	13	1/15/73 - 1/17/73
W20270	D-23115	12	1/17/73 - 1/18/73
W20271	D-23116	13	1/18/73 - 1/20/73
W20272	D-23117	8	1/20/73 - 1/21/73
W20273	D-23118	10	1/21/73 - 1/23/73
W20274	D-23119	12	2/23/73 - 1/24/73
W20275	D-23120	11	1/24/73 - 1/26/73
W20276	D-23121	13	1/26/73 - 1/27/73
W20277	D-23122	10	1/27/73 - 1/29/73
W20278	D-23123	11	1/29/73 - 1/30/73
W20279	D-23124	12	1/31/73 - 2/01/73
W20280	D-23125	12	2/01/73 - 2/03/73
W20281	D-23126	10	2/03/73 - 2/04/73
W20282	D-23328	10	2/04/73 - 2/06/73
W20283	D-23127	11	2/06/73 - 2/07/73
W20284	D-23128	11	2/07/73 - 2/09/73
W20285	D-23129	12	2/09/73 - 2/10/73

W2#	D#	FILES	TIME SPAN
W20286	D-23130	11	2/10/73 - 2/12/73
W20287	D-23131	12	2/12/73 - 2/13/73
W20288	D-23132	12	2/13/73 - 2/15/73
W20289	D-23133	12	2/15/73 - 2/16/73
W20290	D-23134	10	2/16/73 - 2/18/73
W20291	D-23135	10	2/18/73 - 2/20/73
W20292	D-23329	11	2/20/73 - 2/21/73
W20293	D-23136	11	2/21/73 - 2/23/73
W20294	D-23137	11	2/23/73 - 2/24/73
W20295	D-23138	12	2/24/73 - 2/26/73
W20296	D-23330	12	2/26/73 - 2/27/73
W20297	D-23139	10	2/27/73 - 3/01/73
W20298	D-23140	10	3/01/73 - 3/02/73
W20299	D-23141	11	3/02/73 - 3/04/73
W20300	D-23142	10	3/04/73 - 3/05/73

3
5-A Condensed ORBIT TAPES

DSN = EXPTAPE, DENSITY = 2 (800 BPI), TRACK = 7 TRACKS,
LABEL = SL

ORBIT Nos	TAPE VOL. NO.	NO. of FILES
1 - 5	W 20001	10
6 - 10	W 20002	11
11 - 15	W 20003	13
16 - 20	W 20004	11
21 - 25	W 20005	14
26 - 30	W 20006	13
31 - 35	W 20007	10
36 - 40	W 20008	10
41 - 45	W 20009	12
46 - 50	W 20010	12
51 - 55	W 20011	13
56 - 60	W 20012	13
61 - 65	W 20013	10
66 - 70	W 20014	10
71 - 75	W 20015	11
76 - 80	W 20016	10
81 - 85	W 20017	10
86 - 90	W 20018	10
91 - 95	W 20019	10
96 - 100	W 20020	10
101 - 105	W 20021	10
106 - 110	W 20022	10
111 - 115	W 20023	10
116 - 120	W 20024	10
121 - 125	W 20025	10
126 - 130	W 20026	10
131 - 135	W 20027	10
136 - 140	W 20028	10
141 - 145	W 20029	10
146 - 150	W 20030	10
151 - 155	W 20031	12
156 - 160	W 20032	10

ORBIT NOS	TAPE VOL NO.	NO. OF FILES
161 - 165	W20033	10
166 - 170	W20034	11
171 - 175	W20035	10
176 - 180	W20036	10
181 - 185	W20037	10
186 - 190	W20038	10
191 - 195	W20039	10
196 - 200	W20040	12
201 - 205	W20041	10
206 - 210	W20042	10
211 - 215	W20043	10
216 - 220	W20044	10
221 - 225	W20045	10
226 - 230	W20046	10
231 - 235	W20047	10
236 - 240	W20048	10
241 - 245	W20049	10
246 - 250	W20050	12
251 - 255	W20051	10
256 - 260	W20052	10
261 - 265	W20053	10
266 - 270	W20054	10
271 - 275	W20055	10
276 - 280	W20056	10
281 - 285	W20057	11
286 - 290	W20058	10
291 - 295	W20059	10
296 - 300	W20060	10
301 - 305	W20061	10
306 - 310	W20062	10
311 - 315	W20063	10
316 - 320	W20064	10
321 - 325	W20065	10
326 - 330	W20066	10
331 - 335	W20067	10
336 - 340	W20068	10

ORBIT NOS	TAPE VOL NOS	NO of FILES
341 - 345	W20069	10
346 - 350	W20070	10
351 - 355	W20071	10
356 - 360	W20072	11
361 - 365	W20073	10
366 - 370	W20074	10
371 - 375	W20075	10
376 - 380	W20076	10
381 - 385	W20077	10
386 - 390	W20078	10
391 - 395	W20079	10
396 - 400	W20080	10
401 - 405	W20081	11
406 - 410	W20082	10
411 - 415	W20083	10
416 - 420	W20084	10
421 - 425	W20085	11
426 - 430	W20086	10
431 - 435	W20087	10
436 - 440	W20088	13
441 - 445	W20089	10
446 - 450	W20090	11
451 - 455	W20091	10
456 - 460	W20092	11
461 - 465	W20093	10
466 - 470	W20094	11
471 - 475	W20095	10
476 - 480	W20096	11
481 - 485	W20097	12
486 - 490	W20098	10
491 - 495	W20099	10
496 - 500	W20100	10
501 - 505	W20101	10
506 - 510	W20102	10
511 - 515	W20103	12
516 - 520	W20104	10

ORBIT #'s	TAPE VOL.	# FILES
521-525	W20105	10
526-530	W20106	3
531-535	W20107	13
536-540	W20108	10
541-545	W20109	10
546-550	W20110	10
551-555	W20111	12
556-560	W20112	10
561-565	W20113	10
566-570	W20114	13
571-575	W20115	11
576-580	W20116	14
581-585	W20117	10
586-590	W20118	11
591-595	W20119	7
596-600	W20120	10
601-605	W20121	10
606-610	W20122	6
611-615	W20123	7
616-620	W20124	9
621-625	W20125	11
626-630	W20126	10
631-635	W20127	12
636-640	W20128	10
641-645	W20129	10
646-650	W20130	4
651-655	W20131	9
656-660	W20132	12
661-665	W20133	11
666-670	W20134	10
671-675	W20135	13
676-680	W20136	12
681-685	W20137	11
686-690	W20138	10

ORBIT NOS	TAPE VOL NO	NO. OF FILES
691-695	W20139	10
696-700	W20140	11
701-705	W20141	12
706-710	W20142	10
711-715	W20143	10
716-720	W20144	10
721-725	W20145	13
726-730	W20146	11
731-735	W20147	10
736-740	W20148	10
741-745	W20149	11
746-750	W20150	12
751-755	W20151	10
756-760	W20152	10
761-765	W20153	11
766-770	W20154	12
771-775	W20155	10
776-780	W20156	10
781-785	W20157	10
786-790	W20158	12
791-795	W20159	11
796-800	W20160	10
801-805	W20161	10
806-810	W20162	10
811-815	W20163	10
816-820	W20164	11
821-825	W20165	13
826-830	W20166	10
831-835	W20167	11
836-840	W20168	12
841-845	W20169	11
846-850	W20170	10
851-855	W20171	10
856-860	W20172	11
861-865	W20173	12
866-870	W20174	

ORBIT NOS	TAPE VOL NOS	NO OF FILES
871-875	W20175	11
876-880	W20176	11
881-885	W20177	11
886-890	W20178	10
891-895	W20179	10
896-900	W20180	12
901-905	W20181	10
906-910	W20182	12
911-915	W20183	10
916-920	W20184	10
921-925	W20185	12
926-930	W20186	10
931-935	W20187	10
936-940	W20188	11
941-945	W20189	12
946-950	W20190	11
951-955	W20191	10
956-960	W20192	10
961-965	W20193	11
966-970	W20194	11
971-975	W20195	10
976-980	W20196	10
981-985	W20197	11
986-990	W20198	10
991-995	W20199	10
996-1000	W20200	10
1001-1005	W20201	10
1006-1010	W20202	11
1011-1015	W20203	10
1016-1020	W20204	10
1021-1025	W20205	10
1026-1030	W20206	10
1031-1035	W20207	10
1036-1040	W20208	10
1041-1045	W20209	10
1046-1050	W20210	

ORBIT #'s	TAPE VOL. #	# FILES
1051-1055	W20211	11
1056-1060	W20212	11
1061-1065	W20213	11
1066-1070	W20214	10
1071-1075	W20215	10
1076-1080	W20216	12
1081-1085	W20217	11
1086-1090	W20218	10
1091-1095	W20219	10
1096-1100	W20220	10
1101-1105	W20221	8
1106-1110	W20222	10
1111-1115	W20223	10
1116-1120	W20224	11
1121-1125	W20225	11
1126-1130	W20226	2
1131-1135	W20227	10
1136-1140	W20228	10
1141-1145	W20229	11
1146-1150	W20230	10
1151-1155	W20231	11
1156-1160	W20232	10
1161-1165	W20233	10
1166-1170	W20234	10
1171-1175	W20235	12
1176-1180	W20236	10
1181-1185	W20237	15
1186-1190	W20238	13
1191-1195	W20239	10
1196-1200	W20240	12
1201-1205	W20241	10
1206-1210	W20242	11
1211-1215	W20243	12
1216-1220	W20244	11

ORBIT NOS	TAPE VOL NO	NO FILES
1221 - 1225	W20245	10
1226 - 1230	W20246	10
1231 - 1235	W20247	12
1236 - 1240	W20248	10
1241 - 1245	W20249	12
1246 - 1250	W20250	10
1251 - 1255	W20251	11
1256 - 1260	W20252	13
1261 - 1265	W20253	12
1266 - 1270	W20254	10
1271 - 1275	W20255	10
1276 - 1280	W20256	13
1281 - 1285	W20257	11
1286 - 1290	W20258	11
1291 - 1295	W20259	10
1296 - 1300	W20260	10
1301 - 1305	W20261	12
1306 - 1310	W20262	11
1311 - 1315	W20263	11
1316 - 1320	W20264	11
1321 - 1325	W20265	11
1326 - 1330	W20266	12
1331 - 1335	W20267	12
1336 - 1340	W20268	10
1341 - 1345	W20269	13
1346 - 1350	W20270	12
1351 - 1355	W20271	13
1356 - 1360	W20272	8
1361 - 1365	W20273	10
1366 - 1370	W20274	12
1371 - 1375	W20275	11
1376 - 1380	W20276	13
1381 - 1385	W20277	10
1386 - 1390	W20278	11
1391 - 1395	W20279	12
1396 - 1400	W20280	13

ORBIT #'S	TAPE VOL	# FILES
1401 - 1405	W20281	10
1406 - 1410	W20282	10
1411 - 1415	W20283	11
1416 - 1420	W20284	11
1421 - 1425	W20285	12
1426 - 1430	W20286	11
1431 - 1435	W20287	12
1436 - 1440	W20288	12
1441 - 1445	W20289	12
1446 - 1450	W20290	10
1451 - 1455	W20291	10
1456 - 1460	W20292	11
1461 - 1465	W20293	11
1466 - 1470	W20294	11
1471 - 1475	W20295	12
1476 - 1480	W20296	12
1481 - 1485	W20297	10
1486 - 1490	W20298	10
1491 - 1495	W20299	11
1496 - 1500	W20300	10

(b)

10 EXPERIMENTER TAPES (Cat. S^3-A Non-condensed orbits 1501-3418)

SLOT	ORB	# OF FILES	TLS #
W01104	1727	2	
W01105	1818	2	
W01106	2171	2	
W01107	2367	2	
W03017	2125	2	
W03018	2126	2	
Y199	1751	2	32485
Y680	2357	2	32822
Y175	1517	2	32474
Y198	3102	3	32484

Characteristics for above tapes

DENSITY = 1 (~~556~~ bpi) 6250 ; ~~7~~ 9 TRACKS ; Non-Labelled.

INFORMATION ABOUT S^3-A SUMMARY PLOT TAPES

~~7~~ 9 TRACKS
DENSITY = ~~1~~ 4 (~~556~~ 6250 b.p.i)
Non-labelled

# of files ≡ # of ORBITS specified ON THE TAPE STICKER

(d)

S³-A COA TAPES

[illegible] VOL NO. L TAPE SLOT	FLS SLOT NO.	ORBIT SPAN	START DATE	STOP DATE
Z 2158	37815	1-152	11-15-71	1-03-72
Z 2159	37816	152-332	1-03-72	3-01-72
Z 2160	37817	331-522	2-29-72	5-01-72
Z 2161	37818	522-711	5-01-72	6-30-72
Z 2162	37819	712-905	6-30-72	8-31-72
Z 1392	37393	906-1097	8-31-72	10-31-72
Z 1393	37394	1091-1292	10-29-72	12-31-72
Z 1394	37395	1293-1476	1-01-73	2-26-73
Z 1395	37396	1481-1680	2-27-73	4-29-73
Z 1082	30703	1681-1885	4-29-73	7-01-73
Z 1083	30704	1881-2085	6-29-73	8-31-73
Z 1084	30705	2082-2283	8-30-73	10-30-73
Z 1062	30691	2283-2485	10-30-73	12-31-73
Z 1063	30692	2486-2681	12-31-73	2-27-74
Z 1064	30693	2682-2892	2-27-74	5-01-74
Z 1065	30694	2892-3073	5-01-74	6-24-74
Z 1061	30690	3074-3418	6-24-74	9-30-74

ALL COA (CONDENSED ORBIT ATTITUDE) TAPES HAVE THE FOLLOWING CHARACTERISTICS

DSN = [illegible]
DENSITY = 3 (1600 BPI)
TRACKS = 9
# OF FILES = 1
LABEL = SL
DISP = SHR

SOFTWARE PACKAGE

TAPE WITH SOURCE SOFTWARE PROGRAM

UNIT = 9 TRACK
DCB = (DEN = 3, RECFM = FB, LRECL = 80, BLKSIZE = 3200)
LABEL = (1, NL)
7 FILES

FILE #	PROG	
1	SUMMARY PLOT PROGRAM (to be used with calibration tape)	User's Guide #3
2	RADE	User's Guide #2
3	QUICK LOOK OPTION A	User's Guide #1
4	Q.L. OPTION B	User's Guide #1
5	Q.L. OPTION C	User's Guide #1
6	Q.L. OPTION D	User's Guide #1
7	Q.L. OPTION R	User's Guide #1

ALSO

USERS GUIDE TO RADE
AND QUICK LOOK

USERS GUIDE TO SUMMARY PLOT PROGRAM
INCLUDING
1) OBJECT DECK
2) LIST OF ZERO LEVELS.
3) CALIBRATION TAPE:
9 TRACK DCB = (DEN=3, RECFM=VBS, LRECL=4984, BLKSIZE=4988)
LABEL = (1,SL) DSN = CALTAB, VOL = Z829

SECTION 6 - SPECIAL PURPOSE RADE PROGRAM EXECUTION INFORMATION

To reference the Special Purpose RADE Program on either the SESCC 360/91 or 360/75, the following JCL and INCLUDE cards are necessary:

```
//LINK.SYSLIB DD DSN=M2.ZBNKB.REGRADE,DISP=SHR
//            DD DSN=M2.ZBNKB.SPANDUT,DISP=SHR
```

The needed "include" cards are:

```
INCLUDE SYSLIB(TAPRED)
INCLUDE SYSLIB(SPPURP)
INCLUDE SYSLIB(BDSPRD)
```

The user should allow 241K bytes of core storage on either 360 computer for the Special Purpose RADE Program.

(CSC) Files 3-7 3000-00900-02TN

USER'S GUIDE FOR THE QUICK-LOOK PLOT PROGRAM

Prepared By

COMPUTER SCIENCES CORPORATION

Dr. N. K. Bewtra

For

GODDARD SPACE FLIGHT CENTER

Under

Contract No. NAS5-11999
Task Assignment No. 009

DECEMBER 1973

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SECTION 1 - INTRODUCTION

The S^3-A Quick-Look Plot Program generates printed tabular output as well as microfilmed tabular and plotted output for the Explorer 45 (S^3-A) satellite data extracted by the RADE System. Presently, there are four versions of this program: QLLMA, QLLMB, QLLMC, and QLLMR. Table 1-1 lists the various flight programs available in each version. Tables 2-1, 2-2, and 2-3 list the channels included in each version along with the arrangement of the printed output. Table 3-1 shows the organization of the plotted output. Executable load modules of the various versions are stored on the SESCC S/360-75 (QLLMA, QLLMB, and QLLMR) and on the S/360-91 (QLLMA, QLLMB, and QLLMC). Table 4-1 lists the job control statements for calling these programs. The various diagnostic messages are listed in Section 5.

The first data card controls the various options available in the output (see Section 4.8). The second data card specifies in Greenwich Mean Time (GMT) the start and stop times of the interval for which data are to be extracted from the S^3-A Experimenter Tape for a specified orbit. Additional intervals can be specified on succeeding data cards. However, for the non-Condensed Experimenter tapes the additional requests must be for the same orbit; for the Condensed Experimenter tapes the requests must be for one (of the usually five) orbits on that tape. The specified time interval is divided into consecutive three-minute intervals. (For this interval the resolution on the graphs is still acceptable and the storage requirement for QLLMA, QLLMB, and QLLMC is less than 500K). The magnetic local time (MLT) in hours and minutes, the altitude (ALT) above the surface of Earth in kilometers, and the L-value (L) are also required at half-minute intervals, and are provided from data on the condensed 360-version of the Predict Orbit input tape. The second data card also controls the option of lead parity frame editing.

To incorporate a new spacecraft flight program into any Quick-Look Program version, it is necessary to incorporate changes in the appropriate BLOCK DATA subprogram and to recreate the load module. Presently, each version is capable of handling up to 48 flight programs. The BLOCK DATA subprogram also has the information for the sector factor, calibration flag, and mode sampling factor for each channel processed by that version. Any other change will necessitate making changes in the program code. Table 1-1 lists the different spacecraft flight programs each version is currently capable of processing.

Table 1-1. Flight Programs Included in Each Version

Version	Spacecraft Flight Programs
QLLMA	501F; 502I; 521A, B; 522B; 525A, B, C, D; 527A, B, C, D, E; 535A, B, C, D; 565A; 567A.
QLLMB	521A, B; 522B; 524A, B; 525A, B, C, D; 527A, B, C, D, E; 535A, B, C, D; 544A, B; 563A, B; 564A, B, C; 565A; 567A, B; 571A, B; 572A; 574A; 575A; 601B.
QLLMC	545A, B, C, D, E, F.
QLLMR	529A, B; 547A; 549A, B.

SECTION 2 - PRINTED OUTPUT

Values for MLT, ALT, and L are needed at half-minute intervals. Each three-minute data segment therefore includes values for MLT, ALT, and L along with new column headings at the beginning of each half-minute segment. Except for rapid-sample data, column headings are printed on every other page if none of the data was processed more than once per sector. There is an option to delete the normal printed output, and also an option for obtaining the "rough printout", which is useful for debugging purposes. This is simply a listing of the input data from the Experimenter tape by channel number.

2.1 VERSION QLLMA

This version processed P2 data from all of the programmable channels except for: DC*50 and DC*100 (channels 9 and 10), rapid-sample data (channels 28-30), spacecraft clock (channels 32-34), the condition bits (channel 36), and star and sun data channels (61-62). It also processed P1 data from channels 40 and 57-58, along with data from subcom channels 102-107, 123-124, and 241. The data from the various channels are grouped together for printing as shown in Table 2-1.

2.2 VERSION QLLMB

This version emphasizes particle data along with DC fields data. Only P2 data are processed. The channels for which data are extracted and their grouping for printing are shown in Table 2-2.

2.3 VERSION QLLMC

This version emphasizes the SSPD along with the DC fields. Only P2 data are processed. The channels for which data are extracted are shown in Table 2-3.

2.4 VERSION QLLMR

This version processes all of the channels in version QLLMA except channels 5, 6, 7, 16-17, 22-23, and 40 (P1). Also the rapid-sample magnetic field data of channels 28-29 and 40-42 are processed. The AC magnetic field and the two-byte (spacecraft) fluxgate magnetometer data are grouped with the rapid-sample

Table 2-1. Organization of Printed Output of Version QLLMA

Page Heading	Spacecraft Channels (In Ascending Order)
CHANNELTRONS	1-2, 48-49, 57-58(P1 and P2), 123-124(Subcom).
SSPD and SSED	0, 4, 5, 50, 51-56.
DC ELECTRIC AND MAGNETIC FIELDS AND 1B1	8(P2 only), 11-14, 40(P2 and P1), 41-42(P2 only), 43, 102-107(Subcom) and 241(Subcom).
AC MAGNETIC FIELD-SEARCH COILS	6, 7, 16-21, 22-27.
AC ELECTRIC FIELD-NARROW BAND FILTERS	3,35

Table 2-2. Organization of Printed Output for Version QLLMB

Page Heading	Spacecraft Channels (In Ascending Order)
CHANNELTRONS AND DC ELECTRIC AND MAGNETIC FIELDS	1, 2, 8(P2 only), 40-41(P2 only), 43, 48-49, and 241(Subcom).
SSPD and SSED	0, 4, 5, 50, 51-56.

Table 2-3. Organization of Printed Output for Version QLLMC

Page Heading	Spacecraft Channels (In Ascending Order)
SSPD AND DC ELECTRIC AND MAGNETIC FIELDS	4, 8, 40-42(P2 only), 51-56 and 241(Subcom).

data and all these data are divided into rolls instead of into half-minute intervals. Thus, the values for MLT, ALT, and L are not given for the individual rolls. The channels for which data are extracted and their grouping for printing are shown in Table 2-4.

Table 2-4. Organization of Version QLLMR Printed Output

Page Heading	Spacecraft Channels (In Ascending Order)
CHANNELTRONS	1-2, 48, 49, 57-58(P1 and P2), 123-124(Subcom).
SSPD and SSED	0, 4, 50, 51-56.
DC ELECTRIC AND MAGNETIC FIELDS AND 1B1	8(P2 only), 11-14, 40-42(3S/C bytes, P2 only), 43, 102-107, and 241(Subcom).
AC ELECTRIC FIELD-NARROW BAND FILTERS	3, 35.
RAPID-SAMPLE MAGNETIC FIELDS (BY ROLLS)	18-21, 24-27, 28-29, 40-42(2 S/C bytes, P2 only).

SECTION 3 - PLOTTED OUTPUT

3.1 TABULAR OUTPUT

An identical copy of the normal printed output described in the previous section is also available on microfilm. The parameters on the first data card (Section 4.8) determine whether the output is written on the same tape as the plots (for filming with the META processor on the SD4060) or on a separate tape (for filming with the P360 processor on the SD4060). In the latter case, a Quick-Look Plot run requires a total of four tape mounts; in the former case, three are required.

3.2 PLOTTED OUTPUT

Most of the printed data also appears in the plot format. The exceptions are:

a. channel 0: gain and bias information;

b. channels 2, 35, 43;

c. P1 data from channels 57-58 if both P1 and P2 data are present;

d. subcom channels 102-107 and 241.

The plots (except for the rapid-sample data) each represent a three-minute segment of data in an interval of 3600 raster units (RU) on the SD4060. The smallest interval of time that can be resolved is therefore 0.05 seconds. For the rapid-sample data, this same 3600 RU interval is divided into four sections with one section corresponding to one roll. Thus, the minimum resolution in this case is 512 subsectors/900 = 0.6 subsector. The vertical resolution is dictated by the arrangement of the plots on the pages. For this reason, the digital counts can go up to a maximum count of $2^{19} - 1$. A digital count of 0 is represented by a plotting symbol centered 16 RU below the 10 to power 0 grid line.

Table 3-1 lists the channels displayed on each plot. The arrangement of the plots is the same for all versions with a particular curve and/or the whole plot being deleted as appropriate.

Table 3-1. Organization of the Plotted Output

Plot	Spacecraft Channels (In Ascending Order)
CHANNELTRONS AND SSED	0 (level only), 1, 48, 49, 50, 57-58 (P1 if both P1 and P2 present).
SSPD - PART 1	52-55 (Note that values for channel 55 in excess of $2^{18.85} = 472638$ fall on the top edge of the plot).
SSPD - PART 2	4, 5, 51, 56
DC ELECTRIC AND MAGNETIC FIELDS	8 (P1 and P2), 11-14, 40-42 (P1 and P2, 3 S/C bytes) (For channel 8, 41, and 42, the P2 points are connected by lines, but P1 points are not).
AC MAGNETIC FIELD-SEARCH COILS	6, 7, 16-21, 24-27 (For the QLLMR version these data are divided into rolls. In others, this covers three minute interval).
AC ELECTRIC FIELD-NARROW BAND FILTERS	3
RAPID-SAMPLE SEARCH COIL FLUXGATE (ROLLS)	28, 29, 40, 41, 42 (2 S/C bytes; P2 only).
AC MAGNETIC FIELD-SEARCH COILS (ROLLS)	18-21, 24-27.

SECTION 4 - EXECUTION INFORMATION

The job control statements and input data cards required to execute a run in any version are shown in Table 4-1.

4.1 JOB CARD

The CPU and I/O time estimates for S/360-75 and -91 are shown in Table 4-2.

4.2 EXEC STATEMENT

The current region sizes are shown in Table 4-3. This includes space for a dump in case of abnormal termination.

4.3 THE FT06F001 DD STATEMENT

The SYSOUT class can be changed from A to D if a large amount of printout is anticipated (the estimate for the space can be made by noting that 53 printed output lines occupy one track on the model 2314 disk and that one cylinder has 20 tracks).

4.4 FT01F001 DD STATEMENT

Enter the tape number of the appropriate Experimenter input tape with no ring in the reel. Condensed tapes are labeled and non-condensed tapes are unlabeled.

4.5 FT10F001 DD STATEMENT

Enter the tape number of the appropriate "Predict Orbit" input tape with no ring the reel. This is a labeled tape.

4.6 SC4060ZZ DD STATEMENT

Enter the tape number of the unlabeled output tape with a ring in the reel. The plotted output and tabular output (if this is not on a separate tape) are written on this tape for filming with the META processor on the SD4060. The number of frames of microfilm appears at the end of a run printout.

4.7 FT12F001 DD STATEMENT

This is required if the tabular output is on a tape different from that with the graphed output. This tabular output can be deleted (e.g., in a debugging run)

Table 4-1. Job Control Statements and Input Data Cards

```
//JOB CARD
// EXEC PGM=QLLMX,REGION=XXXK
//STEPLIB DD DSN=M2.M1RFB.M1ECS.S30LLM,DISP=SHR
//FT06F001 DD SYSOUT=A,SPACE=(TRK,(90,90)),UNIT=(2314,3),
//      DCB=(RECFM=VBA,LRECL=137,BLKSIZE=7265)
//SC4060ZZ DD DSN=&&PLT,UNIT=(7TRACK,,DEFER),DISP=(NEW,KEEP),
//      DCB=(DEN=2,TRTCH=C,RECFM=F,BLKSIZE=1024),LABEL=(1,NL,,OUT),
//      VOL=SER=XXXX
//FT12F001 DD DSN=DDDD,UNIT=(7TRACK,,DEFER),DISP=(NEW,KEEP),
//      DCB=(RECFM=VBA,TRTCH=C,BLKSIZE=1920,LRECL=137,DEN=2),
//      LABEL=(1,SL,,OUT),
//      VOL=SER=XXXX
//FT10F001 DD DSN=SSSORB,UNIT=(9TRACK,,DEFER),DISP=SHR,DCB=BUFNO=1,
//      VOL=SER=XXXX
//FT01F001 DD UNIT=(7TRACK),LABEL=(1,NL,,IN),DISP=SHR,
//      DCB=(DEN=1,BUFNO=1,RECFM=U,BLKSIZE=10000),
//      VOL=SER=XXXX                FOR NON-CONDENSED EXPERIMENTER TAPES
//FT01F001 DD UNIT=(7TRACK),LABEL(1,SL,,IN),DSN=EXPTAPE,DISP=SHR,
//      DCB=(BUFNO=1,BLKSIZE=10000),
//      VOL=SER=XXXX                FOR CONDENSED EXPERIMENTER TAPES
//GSFCDUMP DD SYSOUT=A
//SYSUDUMP DD SYSOUT=D,SPACE=(CYL,(2,1))
//FT05F001 DD *
      FIRST INPUT DATA CARD,  FORMAT(4I5,4L5)
      SECOND INPUT DATA CARD, FORMAT(15I5)
      ADDITIONAL SECOND INPUT DATA CARDS,IF NEEDED.
      THIS MUST BE FOR THE SAME ORBIT IN CASE OF
      NON-CONDENSED EXPERIMENTER TAPES AND FOR ONE
      OF (THE FIVE) ORBITS ON THE SAME CONDENSED
      EXPERIMENTER TAPES.
/*.
```

Table 4-2. Computer Time Estimates (Seconds)
For Three Minute Data Segment

SYSTEM / 360-75

Operation	QLLMA	QLLMB	QLLMR
CPU	33	27	30
I/O	16	13.5	12

SYSTEM / 360-91

Operation	QLLMA	QLLMB	QLLMC
CPU	14.1	8.7	10.1
I/O	13.4	10.2	11.5

The I/O time estimates above are for one output tape (both tabular and graphed output on the same tape). In case of separate tapes for tabular and graphed output, this may be about 20% lower.

Table 4-3. Region Sizes For Various Versions

No. Of Output Tapes	QLLMA	QLLMB	QLLMC	QLLMR
one	466K	482K	406K	504K
two	472K	488K	412K	510K

with the following DD statement, using the DUMMY positional parameter:

//FT12F001 DD DUMMY,DCB=(RECFM=FBA,BLKSIZE=1920, LRECL=137)

Note that at present there is no count of the number of frames of microfilm on this tape. The tabular output is written on this tape for filming with the P360 processor on the SD4060.

4.8 FIRST INPUT DATA CARD

The format for this card is (4I5, 4L5). The variables in order are:

1. = 1

2. = an integer greater than the orbit number on the second data card and less than 4000.

3. = 1

4. = 10 if the tabular output goes onto SC4060ZZ for filming;

   = 12 if the tabular output goes onto FT12F001 (there are two output tapes).

5. = T to obtain the plotted output when the above variable is 10 or 12.

   = F to delete the plotted output when the above variable is 12 and statement SC4060ZZ DD (Section 4.6) is unnecessary.

6. unused

7. = T to obtain "rough printout" (used for debugging purposes only).

   = F to delete "rough printout".

8. = T to delete the tabular printed output (the count of number of frames of SD4060 film still appears as well as all the other functional control statements).

   = F to obtain the tabular printed output.

4.9 SECOND (AND ANY SUCCEEDING) INPUT DATA CARD

The format for this card is(15I5). The items in sequence are:

1. = orbit number for this request (for non-Condensed tapes, all subsequent requests must be for the same orbit; for Condensed tapes they can be for any of (the five) orbits on this tape).

2 - 7 correspond to the start time for the interval for which data are to be extracted.

- 2. = year (between 1971 and 1975).
- 3. = month.
- 4. = day.
- 5. = hour.
- 6. = minute.
- 7. = second (must be 0 or 30).

8 - 13 correspond to the stop time for the interval for which data are to be extracted in the same order as above.

14. = 0 if no bad parity editing is requested (Reference 2).

= 9 if bad parity editing is requested (Reference 2).

15. = 1 for non-Condensed Experimenter tapes.

= file number of the orbit requested for Condensed Experimenter tapes.

value of 1 is substituted if this column is left blank in the data card.

SECTION 5 - DIAGNOSTIC AND INFORMATIVE MESSAGES

Listed below are some messages which can appear in the Quick-Look Plot Program. Various self-explanatory messages, and messages associated with the RADE System are not described. The latter are listed in Reference 1 and 2. Messages of the type ' NO xxx ' refer to the RMAIN subroutine and those of the type ' NO xxx P ' refer to the PROCES subroutine of the pertinent version. In general, each such message can branch from various places in the program. Thus, any such message will be followed by the statement number in the subroutine which caused the program to print the error message. Unless otherwise indicated, the program terminates after an error messages from subroutine RMAIN. In the case of the PROCES subroutine, processing for the current three minutes is terminated but the next three minutes are processed.

Error Message	Cause
No. 915	First data card has an error (e.g., orbit number is outside the range possible).
No. 925	Second data card has an error, or the roll period from RADE System is wrong. Check the start date.
No. 935	Error in start or stop time on the second data card.
No. 965	RADE System returned an invalid value of WFLAG (greater than 1).
No. 975	The on-board flight program present at the requested interval cannot be processed by this version.
No. 985	The values read from the Predict Orbit Tape are invalid. The program will not terminate.
PL 955	Number of points to be plotted in negative. This originates from the PL4060 subroutine.

Error Message	Cause
No. 905 P	For SSPD Analog 1 (channel 4), a length other than two or three bytes has been specified in BLOCK DATA.
No. 909 P	There are more than 65 half rolls or more than four physical records in a three-minute interval. This error appears only in the R Version.
No. 915 P	More than 130 sectors occurred in 30 seconds. Check the roll period in the RADE System BLOCK DATA.
No. 925 P	More AC field (channel 3) data points were encountered than permissible.
No. 935 P	Either (a) channels 0, 1, 2, 43 (used for spacing) are all absent; (b) or, if present, there are less than three points.
No. 945 P	Array IPTMAX is filled. Check the array size assigned in BLOCK DATA for different channels.
No. 985 P	Telemetry spacing problem. Physical record is longer than 75 seconds.
No. 5905 P	More than 16 distinct levels encountered while establishing SSED levels.

REFERENCES

1. Computer Sciences Corporation, 9101-03900-01TN, Methodology for Extracting Telemetry Data for the Small Scientific Satellite, R. Finnin.

2. Computer Sciences Corporation, 3000-00900-01TN, User's Guide for the RADE Data Extraction Program, R. Finnin.

(#2) File 2

3000-00900-01TN

USER'S GUIDE
FOR THE
RADE DATA EXTRACTION PROGRAM

R. Finnin

Prepared by
COMPUTER SCIENCES CORPORATION

For
GODDARD SPACE FLIGHT CENTER

Under
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TABLE OF CONTENTS

SECTION 1 - RADE PROGRAM FUNCTION

1.1 FUNCTIONAL DESCRIPTION

The RADE Program is a user-callable subroutine designed to operate on S/360. RADE decommutates (extracts) data from S^3 experimenter telemetry tapes(s) according to user specified addressable channels ("sensors"), related factors, S/C orbit and times. The decommutated (extracted) data is stored, together with calculated GMT and other identifying information, in an array which is in core. The decommutated data is stored within the array by addressable channel, and P1 and P2 gathered data are separated and identified.

The RADE Program performs a pre-editing of the telemetry data prior to processing. Smoothing of questionable DFC indication bits and fields is accomplished where feasible, or else the telemetry frames involved are not processed. A message to the user is printed each time that data in a telemetry frame is either smoothed or rejected.

In connection with the decommutation function, this subroutine also reads in identification and header records, the Sampling Identification Dictionary (SID), and telemetry data records, all from magnetic tape. RADE calculates the GMT at which each datum was sampled by the on-board flight program in the spacecraft. The calculation depends on whether the datum was sampled by the P1 or P2 portion of the spacecraft program, and also on whether the P2 Program was synched to the data sync clock or the S/C clock. The subroutine also prints out messages to the operator and to the user concerning action to be taken, the status of the program, format errors, etc.

RADE also extracts fixed field data appearing in the telemetry to the following extent:

(a) Sub-com data is extractable by specifying the sub-com channel desired. Accompanying this data is the calculated GMT, which is calculated in the same way as regular P1 sampled data.

(b) All fixed field telemetry data is extractable by specifying a flag to that effect. Accompanying each 12 S/C bytes (48 bits) of fixed field data is GMT, calculated in the same way as regular P1 sampled data, and references the first byte in the fixed field.

RADE is called any number of times in a single program execution, and is able to handle S^3 telemetry data from different orbits in a single execution.

SECTION - 2 INPUT/OUTPUT OVERVIEW

2.1 INPUT

Inputs to RADE are user specified parameters (via COMMON area and arguments in the subroutine call), and S^3 telemetry data on 556 bpi, 7-track magnetic tapes. The main user specified parameters consist of:

orbit number (start) orbit number (stop) begin time end time	defines time frame for which data is to be extracted

file number of first file in orbit

flag, frame header parity editing

fixed field data flag

addressable and/or sub-com channel numbers

sector factors desired (if applicable)

calibration factors desired (if applicable)

mode sampled factors desired (if applicable)

The telemetry data is located on the S^3 experimenter tapes, together with associated telemetry information, with up to five orbits of information per reel. Each orbit of information consists of:

(a) tape header record

(b) file header record(s)

(c) SID records

(d) telemetry data (in records of 32 telemetry frames)

2.2 OUTPUT

Output from RADE consists of the requested decomed telemetry data and associated GMT with appropriate identifying information residing in core. This information is in ascending addressable channel order, and, within addressable channel, in sampling mode group order P1, then P2. Within each sampling mode group, the decomed telemetry data is in ascending time sequence. Totals, denoting the number of decomed data-associated time pairs found for each addressable channel, and also, certain processing flags, denoting possible error conditions, are also provided.

In addition, messages to the operator in regard to proper tape reel mounting and demounting, and informational and error messages to the user on the standard output printer unit, are provided.

2.3 CALLING SEQUENCE

Call RADE (IRETRN, IFLAG)

IRETRN-INTEGER*2 - A flag which performs three functions: (a) communicates the degree of data extraction completion between the user and the RADE Program, (b) communicates to the RADE Program whether the user derives all telemetry frames having a bad parity flag indication in its frame header eliminated from processing, and (c) communicates to the user certain non-standard conditions. The parameter IRETRN is used in the following way: the user sets IRETRN equal to 0 (or 90 if he wishes editing performed based on frame header parity flag) the first time RADE is called. Each time RADE returns to the user, he should interrogate IRETRN, and, if IRETRN=1, move the extracted data from the XTRDAT array for safekeeping, then call RADE again, leaving the value of IRETRN unchanged. If, upon interrogating IRETRN, the user finds that IRETRN=2, then RADE has completed the current data extraction request. If when interrogating the variable, the user finds that IRETRN >3, then an error condition has occurred. Depending on the value assigned to IRETRN, the user should take appropriate action. If the user wants to make further initial calls, for example, to access data from another orbit, IRETRN should be set to 3 (or 93 if he wishes editing performed based on frame header parity flag).

IRETRN VALUE	Meaning
0	first "initial" call to RADE; process all frames, regardless of bad parity labeling.
90	first "initial" call to RADE; eliminate from processing all frames labeled bad parity frames.
3	subsequent "initial" call to RADE; process all frames, regardless of bad parity labeling.
93	subsequent "initial" call to RADE; eliminate from processing all frames labeled bad parity frames.
1	process the next data record, as already specified regarding bad parity frame editing.
2	RADE has completed all processing for the current initial call to RADE.

An initial call to RADE is defined as one requesting a complete time interval (as opposed to a call to RADE to request continued processing of a time interval already requested).

If the user has requested that bad parity editing be performed, then the respective RADE Program prints a message on the standard printer unit of the form:

"SEQUENTIAL FRAME NO. ..... HAS BAD PARITY. TIME OF 11th BYTE IS ...... MILLISECS"

each time a frame labeled bad parity is encountered. Also, if all the valid frames in a data record are labeled bad parity, then the message:

"ALL ..... VALID FRAMES IN THIS DATA RECORD HAVE BAD PARITY"

is printed on the standard printer unit.

The following values of IRETRN are set by RADE and refer to the error condition specified:

4	Tape mounted does not have specified orbit number.
5	User specified start time preceeds start time of tape.
6	A read error or unexpected EOF has occurred while searching for the first data record to process.
7	User specified start time exceeds stop time of tape.
8	Not used
9	Insufficient core storage allocation for SID. RADE cannot continue.
10	Have reached end-of-tape (i.e., double EOF sensed) or Have reached tape header file for new orbit.
11	User requested start time falls between two files on a multi-file tape. User: determine start and stop times of pertinent files and resubmit with more accurate start time.
12	RADE was called with an invalid code for IRETRN.
13	User requested times are backwards (i.e., user stop time precedes start time and midnight situation not pertinent).
14	Tape header indicated days same, but file header indicates days different.
15	A read error or unexpected EOF has occurred while attempting to read a tape header record.
16	A read error or unexpected EOF has occurred while attempting to read a file header record.
17	A read error or unexpected EOF has occurred while attempting to read a SID record.

18 A read error or unexpected EOF has occurred while attempting to read a data record which is to be processed.

19 The subroutine P2SYNC is in a loop due to either of the following:

- The P2 SID table is bad, or
- There are parity errors in the data.

IFLAG-INTEGER*2 - the array name of the core array where codes denoting the outcome of attempted searches for telemetry data are to be stored. The i-th value of IFLAG will denote the outcome of the search for the i-th requested addressable or sub-com channel. Possible values and their associated meanings for the k-th entry for IFLAG include:

IFLAG	Meaning
0	Successful processing accomplished for the k-th addressable or sub-com channel requested.
1	No data found for the k-th requested addressable or sub-com channel.
2	The k-th requested addressable or sub-com channel code is an illegal code.

Other values for IFLAG will be assigned as needed.

2.4 INPUT PARAMETERS FROM COMMON

Some of the input and output parameters used by RADE are transmitted via a named COMMON block. XTRDAT and BFFRFF are output parameters, all others are input. They are described below.

FORTRAN IV VARIABLE NAME	PARAMETER DESCRIPTION
XTRDAT	Extracted data and associated information from specified addressable and sub-com channels.

FORTRAN IV VARIABLE NAME	PARAMETER DESCRIPTION
BFFRFF	Extracted data and associated information from fixed field portions of telemetry frames.
ORBSTR	Orbit number (start)
ORBSTP	Orbit number (stop)
TIMSTR	Start time, where TIMSTR (1)* denotes hours TIMSTR (2)* denotes minutes
TIMSTP	Stop time, where TIMSTP (1)* denotes hours TIMSTP (2)* denotes minutes
FFDATA	Flag, indicates whether fixed field data is to be extracted.
NOCHS	Number of addressable channels for which data is to be extracted.
NSUBCM	Number of subcom channels for which data is to be extracted.
ADDRCH	The addressable or sub-com channel number for which data is to be extracted. Specifically, ADDRCH (1) addressable or subcom channel number of first addressable or subcom channel for which data is to be extracted. ADDRCH (2) Addressable or subcom channel number of second addressable or subcom channel for which data is to be extracted, etc.

*If these four quantities are zero, then all data for the corresponding orbits will be extracted.

Note. Acceptable codes for ADDRCH for sub-com channels are: ADD 100_{10} to all subcom A channels numbers*, and ADD 200_{10} to all sub-com B channel numbers, to get the proper code.

CALBFL — The calibration flag to be associated with a specified addressable or subcom channel. Specifically,

CALBFL (1) the calibration flag value for the first addressable or subcom channel for which data are to be extracted.

CALBFL (2) the calibration flag value for the second addressable or subcom channel for which data are to be extracted, etc.

SECFAC — The sector factor value to be associated with a specified addressable channel. This has meaning only when the P2 Program is synced to the data sync clock on the spacecraft. Specifically, SECFAC (1) the sector factor value for the first addressable channel for which data is to be extracted.

SECFAC (2) the sector factor value for the second addressable channel for which data is to be extracted, etc.

MODESM — The mode sampling vactor to be associated with a specified addressable channel. Specifically, MODESM (1) the mode sampling factor to be associated with the first addressable channel for which data is to be extracted.

* Sub-com channels are: A1, A2,..., A64 and B1, B2,......, B64.

MODESM (2) the mode sampling factor to be associated with the second addressable channel for which data is to be extracted, etc.

The following values for the specified variables have the indicated meanings:

FORTRAN IV VARIABLE NAME	Value	Meaning
FFDATA	0	Ignore fixed field telemetry data.
	1	Extract fixed field telemetry data.
CALBFL	0, blank	Ignore calibrated status of datum (i.e., collect all data)
	1	Extract calibrated data only for the associated addressable channel.
	2	Extract non-calibrated data only for the associated addressable channel.
SECFAC	0, blank	Extract every P2 sampled datum for the associated addressable channel.
	n	Extract data for the specified addressable channel every n-th half subsector.
MODESM	0, 110, 111	Extract both P1 and P2 sampled data for the associated addressable channel.
	10	Extract P2 sampled data only for the associated addressable channel.
	100	Extract P1 sampled data only for the associated addressable channel.

Note: Values for MODESM are to be interpreted as decimal.

Note: No ISS data extraction is possible in the current RADE Program; RADE simply "branches around" any ISS sampling. In the S^3 spacecraft timing system, the basic unit is the spacecraft roll, where the roll is subdivided as follows:

32 sectors/roll

16 sub-sectors/sector

2 half sub-sectors/sub-sector

This comes out to 1024 intervals, or half sub-sectors, in a spacecraft roll.

The algorithm used to determine whether or not a particular datum is extracted by RADE when the user specifies sector factor N, and the sector factor field in the P2 SID is

J = sector number

K = sub-sector number

L = half sub-sector number

is given by the following rule:

extract datum if

ISECTR - N*(ISECTR/N) = 0

where

ISECTR = 32*J + 2*K + L and

ISECTR/N is performed by integer arithmetic (giving a truncated result).

The following chart indicates the sampling frequency for various values of SECFAC supplied through COMMON:

n	Data to be Extracted at Following Frequencies (Sector, Sub-Sector, $\frac{1}{2}$ Sub-Sector)
0	(0, 0, 0), (0, 0, 1), (0, 1, 0), (0, 1, 1), . . .
2	(0, 0, 0), (0, 1, 0), (0, 2, 0), (0, 3, 0), . . .
3	(0, 0, 0), (0, 1, 1), (0, 3, 0), (0, 4, 1), . . .
5	(0, 0, 0), (0, 2, 1), (0, 5, 0), (0, 7, 1), . . .
32	(0, 0, 0), (1, 0, 0), (2, 0, 0), (3, 0, 0), . . .

The COMMON areas described above are defined in the subroutine RADE by the following FORTRAN IV source statements:

```
REAL*8 XTRDAT (4300)
INTEGER*2 ORBSTR, ORBSTP, TIMSTR(2), TIMSTP(2), ADDRCH(192),
CALBFL(192),SECFAC (64), MODESM (64), FFDATA, NOCHS, NSUBCM
LOGICAL*1 BFFRFF (776)
```

```
COMMON/INPUT/ORBSTR, ORBSTP, TIMSTR, TIMSTP, ADDRCH,
CALBFL, SECFAC, MODESM, FFDATA, NOCHS, NSUBCM
COMMON/OUTPUT/XTRDAT, BFFRFF
```

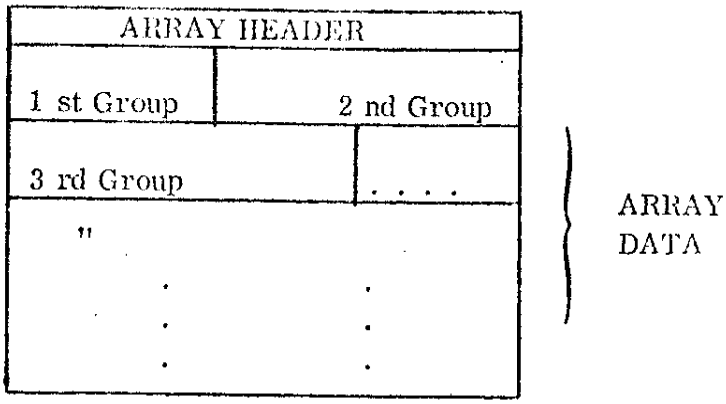
The variable IFLAG should appear in the following type statement:

```
INTEGER*2  IFLAG(192)
```

71-096A-01C-07C
Summary Plot Tapes

SECTION 3 - OUTPUT DESCRIPTION AND FORMAT

RADE outputs are provided in an array described as follows:



3.1 ARRAY HEADER

The ARRAY HEADER contains:

a. Length of entire array in 360 bytes (includes all header type data).

b1. Flag: clock that P2 Program is synced to $\begin{cases} 0 \approx \text{S/C clock} \\ 1 \approx \text{data sync clock} \end{cases}$

b2. Number of groups of data contained in this array.

c. Orbit number of this tape.

d. First Roll Start Time, or S/C clock, sampled at beginning of the first P2 Program cycle (dependent on whether the P2 Program is synced to the data sync clock or to the S/C clock).

e. Spin period, or P2 Program cycle time (dependent on same situation as in (d)).

f. Flight program number (left justified; in EBCDIC).

g. Day of year (from frame header portion, first frame, this physical record).

Note: Each of the above items occupies one double word of 360 core storage, except items b1 and b2, which occupy one 360 word each.

Note: All above items are in binary format, and right justified, except item (f).

h. Data Group Pointers - one appears for each data group appearing in this array. Each pointer consists of:

- Addressable or sub-com channel number.
- Mode (data gathered) flag: 0=denotes data in this group P1 sampled; 1=denotes data in this group P2 sampled; 3=denotes data in this group is sub-com channel data.
- Pointer to first byte of this data group. (This is the number of double words down into the output array one must go to reach the first byte of this data group. Actually, it is the appropriate subscript of XTRDAT.)

A Data Group Pointer has the following format:

WORD 1			WORD 2
Addressable or sub-com channel number	Unused	Flag	Data Group Pointer
0 15	16 29	30, 31	32 63

3.2 ARRAY DATA

ARRAY DATA contains a number of "data groups". A data group consists of a group header, and all the extracted data, flags, and calculated GMT times of a particular addressable or sub-com channel, sampled either by the P1 or the P2 Program. Therefore, for every addressable channel requested by the user whose data was sampled by the P1 Program, and also by the P2 Program, there are two data groups in the output array. Also, for every sub-com channel requested by the user, there is a data group in the output array. The number of data groups appearing in the output array is therefore a function of the sampling scheme of the OBP Program and the number of addressable channels and the number of sub-com channels requested by the user. The maximum number of data groups that the output array can contain is 256.

Each data group has a group header which contains:

a. Addressable or sub-com channel number.

b. Mode (data gathered) flag (same codes and meanings as for data group pointers).

c. Length of this data group, including this group header, in 360 bytes.

A group header has the following format:

WORD 1		WORD 2	
Addressable or sub-com channel number		Flag	Length of this Data Group (in 360 Bytes)
0 15	16 30	31	32 63

Data groups are in ascending addressable and sub-com channel sequence, and within addressable channel, by P1 sampled data, and then P2 sampled data.

The data portion of each data group follows the group header. Each extracted datum and its associated information occupies a 360 double word (8 bytes, or 64 bits) and has the following format:

WORD 1						WORD 2	
Unused	GMT (Millisecs of 36+ Hour Day (27 Bits)	Datum Length		Unused	Flags	Sector Time Info* (10 bits)	Datum (up to 16 bits)
Bit No: 0 4	5 31	32	33	34	35 37	38 47	48 63

*If P2 Program synced to data sync clock; otherwise, zeros.

Bit No.	No. of Bits	Item
0-4	5	Unused
5-31	27	GMT in Milliseconds of 36+ hour day* (calculated)
32-33	2	Datum length**
34	1	Unused
35-36	2	P1, P2, sub-com gathered flag 00 ≈ Datum sampled by P1 Program 01 ≈ Datum sampled by P2 Program 11 ≈ Sampled by sub-com channel
37	1	Calibration Flag 0 Datum not calibrated 1 Datum calibrated
38-47	10	Sector Time Information Bits 38-42 ≈ Sector count Bits 43-46 ≈ Sub-sector count Bit 47 ≈ Half sub-sector count
48-63	16	Extracted Datum
	64 Bits, Total (= one 360 double word)	

Fixed field data and associated information appears with its own header in a separate array, BFFRFF. The fixed field data header occupies a double word, and has the following format:

WORD 1	WORD 2
Unused	Length of array in 360 Bytes
0 — 31	32 — 63

* Need more than 24-hour capacity, for example, when data collection begins just before midnight.

** Meanings of Various Values:

Stored Value	#S/C Bytes Sampled
0	4
1	1
2	2
3	3

The value of the "length of array" includes the eight bytes in the header field.

The data portion of each data group follows the header double word. Each extracted fixed field datum and its associated GMT occupies 96 bits (or 12 360 bytes), and has the following format:

	WORD 1	WORD 2	WORD 3
	GMT (27 Bits)	Unused	Fixed Field Data (48 Bits)
0 4	5 31	32 47	48 95

All information is right justified in its field.

SECTION 4 - EXECUTION INFORMATION

To reference the RADE Program on either the SESCC 360/91 or 360/75, the following JCL and INCLUDE cards are necessary:

```
//LINK.SYSLIB DD DSN=M2.ZBNKB.REGRADE,DISP=SHR
```

The needed "include" cards are:

```
INCLUDE SYSLIB(TAPRED)
INCLUDE SYSLIB(BDREGR)
```

The DD cards for the experimenter (input) tape to the RADE Program are:

```
//GO.FT01F001 DD DSN=EXPTAPE, UNIT=(2400-7,,DEFER),
//  DISP=SHR,DCB=(BLKSIZE=10000,BUFNO=1),
//  VOL=SER=.....
```

The user should allow 239K bytes of core storage on either 360 computer for the RADE Program.

SECTION 5 - SPECIAL PURPOSE RADE PROGRAM FUNCTION

The Special Purpose RADE Program is a modification of the (standard) RADE Program. Special Purpose RADE extracts data for very specific addressable channels and only at very specific sector intervals. These addressable channels and their associated intervals are listed below. The Special Purpose RADE Program is available on both the 360/91 and 360/75 computers. The procedure for executing the program is identical to that for executing the standard RADE Program, except as specified below.

When running the Special Purpose RADE Program (Summary Plot application involving S^3 data), the user should specify the following addressable channels or a subset thereof and associated sector factor values, to extract data at the specified intervals:

ADDR. CH.	SECT. FACT.	INTERVAL	ADDR. CH.	SECT. FACT.	INTERVAL
0	0	All Data	23	0	Data at Sectors 0 and 16 only
1	0	All Data	24	0	Data at Sectors 0 and 16 only
2	0	All Data	25	512	Data at Sectors 0 and 16 only
3	0	All Data	26	512	Data at Sectors 0 and 16 only
4	0	All Data	27	512	Data at Sectors 0 and 16 only
5	0	All Data	32	0	All Data
6	512	Data at Sectors 0 and 16 only	35	0	All Data
7	512	Data at Sectors 0 and 16 only	40	0	All Data
8	0	All Data	41	0	All Data
11	0	Data at Sector 0 and 16 only	42	0	All Data
			48	77	Data at Sectors 2, 6, 18, and 22 only
12	0	Data at Sector 0 and 16 only	49	77	Data at Sectors 2, 6, 18, and 22 only
13	0	Data at Sector 0 and 16 only	50	77	Data at Sectors 1, 6, 17 and 22 only

ADDR. CH.	SECT. FACT.	INTERVAL	ADDR. CH.	SECT. FACT.	INTERVAL
14	0	Data at Sector 0 and 16 only	51	77	Data at Sectors 1, 2, 6, 17, 18 and 22 only
16	0	Data at Sector 0 and 16 only	52	77	Data at Sectors 1, 6, 17, and 22 only
17	0	Data at Sector 0 and 16 only	53	77	Data at Sectors 1, 6, 17, and 22 only
18	0	Data at Sector 0 and 16 only	54	77	Data at Sectors 1, 6, 17, and 22 only
19	512	Data at Sector 0 and 16 only	55	77	Data at Sectors 1, 2, 6, 17, 18 and 22 only
20	512	Data at Sector 0 and 16 only	56	77	Data at Sectors 1, 2, 6, 17, 18 and 22 only
21	512	Data at Sector 0 and 16 only			
22	0	Data at Sector 0 and 16 only			

[illegible]

S^3 FLUXGATE MAGNETOMETER ZERO LEVELS

ORBIT	LOW SENSITIVITY X (GAMMAS)	Y	HIGH SENSITIVITY X (GAMMAS)	Y
10	-5.0	-5.8	-.1	-2.2
31	-3.3	-3.8	-5.4	-6.5
36	-8.6	-6.04	-1.07	-1.08
50	-7.9	-13.7	-13.2	2.3
75	-10.7	-6.1	-1.1	-.8
125	-12.1	-8.9	-1.4	-1.0
155	-11.9	-5.6	-1.0	.31
180	-14.0	-8.5	NOT AVAILABLE	
198	-3.88	-10.9	-1.6	2.25
201	-19.2	-4.31	-2.6	4.18
206	-.83	-9.22	-1.39	5.34
225	-5.6	-4.8	-8.6	0.4
275	-3.5	-5.3	-8.7	-0.1
325	-5.9	-0.5	-0.9	1.1
375	-3.4	-5.0	-0.5	1.6
440	-3.5	-5.0	1.15	-.91
575	-4.7	-5.8	-1.1	-0.4
623	-4.9	-3.2	-0.8	-0.4
650	-6.1	-4.8	-.7	-.2
660	-3.6	-2.8	-.8	-.2
670	-4.4	-.2	.9	2
675	-3.4	-3.1	NOT AVAILABLE	
680	-5.0	.62	1.8	5.4
690	-4.3	.07	1.2	-1.5
691	-5.22	-4.25	-.98	-.29
694	-4.17	-4.32	-.98	-.34

ORBIT	LOW SENSITIVITY X	LOW SENSITIVITY Y	HIGH SENSITIVITY X	HIGH SENSITIVITY Y
703	996	989	NOT AVAILABLE	
710	1000	991	101	98
725	997	991	NOT AVAILABLE	
736	998.9	991.	101.	98.9
775	998	989	NOT AVAILABLE	
791	993	986	100	99
825	999	992	NOT AVAILABLE	
875	978	964	NOT AVAILABLE	
900	998	992	101	99
910	997	991	101	99
920	1000	988	101	99
925	998	988	NOT AVAILABLE	
930	999	993	101	99
950	1001	990	101	99
960	997	989	101	99
961	1002	992	101	99
965	-13.9	-1.3	NOT AVAILABLE	
968	-8.2	-4.3	.8	-1.7
970	-7.1	-4.1	1.0	-1.5
975	-10.0	-4.1	NOT AVAILABLE	
980	-5.6	-6.5	.62	-1.6
990	-8.0	-.9	1.5	-.81
996	-4.24	-5.36	1.15	-1.50
1000	-9.3	-5.6	1.3	-1.5
1020	-5.6	-2.8	1.6	-1.4
1030	-2.8	-.84	1.7	-.97

	LOW SENSITIVITY		HIGH SENSITIVITY	
ORBIT	X	Y	X	Y
1040	-6.5	-3.7	1.4	-1.2
1045	-6.1	-7.3	1.2	-1.6
1048	-3.5	-1.9	1.2	-1.4
1050	-2.1	-1.3	1.5	-1.5
1056	-4.6	-1.4	1.5	1.2
1057	-.89	-5.68	2.23	-.93
1059	-6.0	-1.2	1.3	-1.1
1064	32	48	3.3	2.2
1065	-4.0	6.5	NOT AVAILABLE	
1068	532	528	"	"
1069	534	537	"	"
1074	536	532	"	"
1080	559	545	"	"
1092	550	546	"	"
1100	558	557	"	"
1102	554	555	"	"
1103	701	665	"	"
1104	691	699	"	"
1105	692	683	"	"
1106	787	756	"	"
1107	823	808	"	"
1124	806	796	"	"
1174	800	789	"	"
1224	800	794	"	"
1237	803.7	795.5	"	"
1274	811	810	"	"
1349	813.9	815.4	"	"
1350	821.3	816.5	83.2	79.9
1352	813.4	807.3	82.2	79.8
1353	816.2	816.4	81.5	80.3

ORBIT	LOW SENSITIVITY X	LOW SENSITIVITY Y	HIGH SENSITIVITY X	HIGH SENSITIVITY Y
1359	817.3	813.3	NOT AVAILABLE	
1360	816.4	812.9		
1361	816.4	807.4		
1362	815.5	814.5		
1363	815.5	808.0		
1364	813.9	805.8		
1391-OUT	789.0	776.7		
1391-IN	737.7	727.7		
1392	743.0	730.3		
1395	750.4	745.9		
1396	749.5	745.3		
1397	751.4	747.0		
1424	722	726		
1438	721	721		
1465	732.9	726.2		
1467	730.6	724.9	73.7	71.9
1468	737.7	734.0	NOT AVAILABLE	
1469	761.4	739.2	76.4	734
1470-OUT	753.0	746.5	69.8	67.5
1470-IN	679.1	669.6	68.8	66.6
1474	700.7	688.9	NOT AVAILABLE	
1476	682.4	675.2	69.7	67.7
1477	682	669	68	67
1484	731.6	725.0	73.7	71.6
[illegible]	730	718	73	71
[illegible]	736.3	733.1	68.4	66.3
1487	683.3	677.7	68.4	66.2
1490	676	668	67	68
[illegible]	[illegible]	671.9	NOT AVAILABLE	
[illegible]	702.8	700.6	71.5	69.0
[illegible]	707.9	705.4	71.2	68.8
1494	707.6	696.4	71	69
[illegible]	705.6	695.1	71.2	69.4
[illegible]	712.5	704.5	71.6	69.7
1499	688.4	687.2	69.1	67.1
1502	692.7	686.7	69.9	68.2
1503	694.6	684.1	NOT AVAILABLE	
1504	693.3	687.1	69.9	67.7
1505	691.7	688.6	69.9	67.8

ORBIT	LOW SENSITIVITY X	Y	HIGH SENSITIVITY X	Y
1507	692.5	689.7	70.1	67.7
1510	687.8	683.5	69.9	67.7
1525	693	688	NOT AVAILABLE	
1532		677		
1627		680		

5

Users Guide to SSS-A Summary Plot Program

C. Gloeckler
GSFC
Code 626

To run the Summary plot Program, one must have acess to or information from all of the following:

1). Summary Plot Program
2). Object decks
3). Data Access Routines (RADE, Ref. #1)
4). SD4Ø6Ø Routines
5). List of condensed experimenter tapes
6). List of COA tapes (Condensed Orbit-Attitude)
7). Calibration tape
8). List of zero levels by orbit for the magnetometer

Users Guide to SSS-A Summary Plot Program

All references to size and time are with respect to the IBM 360/91.

I. Source Step. Coding for the Summary Plot Program is written in Fortran IV. To compile the source coding about 300K is necessary and about .85 minutes of CPU and 4.Ø minutes of IO is used.

II. Link Step. The linkage editor has been used in the processing of all summary plots. The link step accesses routines to resolve external references for the plot (SD4Ø6Ø microfilm software) and data acquisition (RADE). These routines are catalogued object modules and are defined to the program by means of the SYSLIB data definition by inserting the following cards after the EXEC card for the link step:

```
//stepname.SYSLIB DD DSNAME=SYS2.SD4Ø6Ø,DISP=SHR
//                DD DSNAME=M2.ZBNKB.REGRADE,DISP=SHR
```

The first card is for the 4Ø6Ø plot routines and the second card is for the RADE system. The form of the second card is such that the second data set is concatenated to the first.

Object decks which have been furnished are used to include utility routines to convert day of year to year, day, month and to obtain the date of processing. The names of these routines are DAIT, DATE, TIME. These decks should be included next with the following card in front:

```
//stepname.OBJECT DD *
```

The linkage editor control cards to be included after the object decks are

```
bINCLUDE SYSLIB(TAPRED)
bINCLUDE SYSLIB(BDREGR)
bENTRY MAIN
```

where b indicates a space.

The data sets TAPRED and BDREGR must be specifically included since they are block data subroutines and they are not automatically called by the linkage editor.

III. Go Step. The Summary Plot Program is restricted to processing data from one orbit for each execution of the 'go' step. The 'go' step executes in 474K and uses about 13 minutes of CPU and 3 minutes of IO for a full orbit of data. Data sets used for input or output must be defined by the following data definition (DD) cards.

1) //GO.FTØ5FØØ1 DD DCB=(BLKSIZE=8Ø,BUFNO=1)

This is used to minimize the buffer size of card input. Since, for most runs, only one data card is necessary, only one buffer is needed to read the 8Ø columns of the data card. This card modifies the link procedure definition where the other parameters are defined. (Ref. #2, 3)

2) //GO.FTØ6FØØ1 DD SPACE=(CYL,(4,1))

This card also modifies the link procedure definition (Ref. #2, 3) to enlarge the space for diagnostic print-out messages. The output is unnecessary for a run which has completed successfully but is useful if a problem occurs, for example, with tape errors.

3) //GO.FTØ1FØØ1 DD DSNAME=EXPTAPE,UNIT=7TRACK,
//bbbDISP=SHR,VOL=SER=xxxx

This defines the condensed experimenter data tape. It is a 7 track, 8ØØ BPI standard labeled tape with many files of data containing many orbits per tape. (A list of tapes with the orbit number and respective file numbers is furnished.) The file to be used is input for a particular orbit on the data card.

4) //GO.FTØ2FØØ1 DD DSNAME=CALTAB,UNIT=9TRACK,
//bbbDISP=SHR,VOL=SER=yyyy

Defines the calibration tape which is used to correct the magnetometer x- and y-axis data. It is a 9 track, 16ØØ BPI, standard labeled tape containing one file.

5) //GO.FT1ØFØØ1 DD DSNAME=SSSORB,UNIT=(9TRACK,,DEFER),
//bbbDISP=SHR,VOL=SER=zzzz

Defines the condensed orbit/attitude tape. It is a 9 track, 16ØØ BPI standard labeled tape from which such parameters such as L-value, magnetic local time, etc., are obtained for the summary plot. (A list of tapes and the orbit numbers of the data they contain is furnished.)

6) //GO.FT15FØØ1 DD DSN=&&PGA,UNIT=DISK,DISP=(NEW,PASS),
//bbbSPACE=(CYL,(3,1)),
//bbbDCB=(RECFM=VBS,LRECL=8Ø4,BLKSIZE=5632,BUFNO=1)

Defines a scratch disk to hold unplotted data until the plotting routines are ready to output onto the 4Ø6Ø tape.

7) //GO.SC4Ø6ØZZ DD UNIT=(7TRACK,,DEFER),DISP=(NEW,PASS),
//bbbDCB=(DEN=1,TRTCH=C),LABEL=(1,NL,,OUT),
//bbbVOL=SER=tttt

This defines the output data set containing the input to the Stromberg Datagraphix 4Ø6Ø plotter which produces the microfilm.

8) //GO.DATA5 DD *

Input data card(s) follow this card.

IV. Data Card(s).

COLUMN	FORMAT	DESCRIPTION
1-4	I4	orbit number, right justified
6-7	I2	hour } start time
9-1Ø	I2	minute } start time
12-15	I4	orbit number, right justified
17-18	I2	hour } stop time
2Ø-21	I2	minute } stop time
23-24	I2	file number, right justified (see section III.3)
25-28	I4	number of minute averages to collect before plotting or writing onto scratch disk: for normal running this should be 25. (in any case must be less than 26)
29-3Ø	I2	1RETRN, right justified (see RADE documentation, Ref. #1, for definition and values). This is set to Ø on the first data card: for multiple data cards set 1RETRN to 3 on successive cards.
35-39	F5.1	x-axis magnetometer zero level: low sensitivity
4Ø-44	F5.1	y-axis magnetometer zero level: low sensitivity
45-49	F5.1	x-axis magnetometer zero level: low sensitivity
5Ø-54	F5.1	x-axis magnetometer zero level: high sensitivity
55-59	F5.1	y-axis magnetometer zero level: high sensitivity
6Ø-64	F5.1	x-axis magnetometer zero level: high sensitivity

If an entire orbit of data is to be processed there will normally be only one data card. However, the program will handle multiple data cards as long as they request data from the same orbit. For efficiency in processing, the data cards should be time ordered with no overlap in time.

Multiple data cards may be necessary in certain instances. For example, if an orbit has such poor experimenter data quality that RADE or the Summary Plot Program causes a halt, the bad time period(s) can be excluded. This is done by using two or more data cards, the first one with the stop time prior to the bad time period and the second card with start time past the bad time period.

This facility also allows processing of intervals of data from a particular orbit.

If multiple data cards are used, the value of 1RETRN on the first data card and on successive data cards should be 3. This allows processing of successive time periods without starting at the beginning of the orbit and processing the SID each time.

The zero levels of the x- and y-axis magnetometer data have been calculated from the magnetometer data prior to processing by the Summary Plot Program. The z-axis magnetometer zero level is unreliable since it is located along the spin axis of the spacecraft and is essentially constant. Hence the x-axis value is used instead. A list of zero levels is furnished for many orbits. An orbit for which no zero level calculations were made should use those of the orbit closest to it. If the high sensitivity levels are not available, the magnetometer was always in the low sensitivity mode for that orbit and then the low sensitivity values should be used for both low and high sensitivity.

V. Sample Deck Setup.

jobcard

```
//COMPILE EXEC FORTRANH,PARM='XREF'
//SYSIN DD *
          (FORTRAN SOURCE DECKS)
//GOTALL EXEC LINKGO,REGION.GO=474K
//LINK.SYSLIB DD DSN=SYS2.SD4Ø6Ø,DISP=SHR
//              DD DSN=M2.ZBNKB.REGRADE,DISP=SHR
//LINK.OBJECT DD *
          (OBJECT DECKS)
 INCLUDE SYSLIB(TAPRED)
 INCLUDE SYSLIB(BDREGR)
 ENTRY MAIN
//GO.FTØ5FØØ1 DD DCB=(BLKSIZE=8Ø,BUFNO=1)
//GO.FTØ6FØØ1 DD SPACE=(CYL,(4,1))
//GO.FTØ1FØØ1 DD DSN=EXPTAPE,UNIT=7TRACK,DISP=SHR,VOL=SER=XXXX
//GO.FTØ2FØØ1 DD DSNAME=CALTAB,UNIT=9TRACK,DISP=SHR,
//    VOL=SER=YYYY
//GO.FT1ØFØØ1 DD DSN=SSSORB,UNIT=9TRACK,DISP=SHR,VOL=SER=ZZZZ
//GO.FT15FØØ1 DD DSN=&&PGA,UNIT=DISK,DISP=(NEW,PASS),SPACE=CYL,(3,1)),
//    DCB=(RECFM=VBS,BUFNO=1,LRECL=8Ø4,BLKSIZE=5632)
//GO.SC4Ø6ØZZ DD UNIT=(7TRACK,,DEFER),DISP=(NEW,PASS),
//    DCB=(DEN=1,TRTCH=C,RECFM=F,BLKSIZE=1Ø24),
//    LABEL=(1,NL,,OUT),VOL=SER=TTTT
//GO.SYSUDUMP DD SYSOUT=A
//GO.DATA5 DD *
Ø327 12 3Ø Ø327 19 Ø6   3   25   Ø    -5.9Ø-Ø.5Ø-5.9Ø-Ø.9Ø+1.1Ø-Ø.9Ø
```

References

1) METHODOLOGY FOR EXTRACTING TELEMETRY DATA FOR THE SMALL SCIENTIFIC SATELLITE, Computer Sciences Corporation, July 1972, NAS 5-11790.

2) SPACE SCIENCES DIRECTORATE COMPUTER USER'S GUIDE, Wolf Research and Development Co., 1 May 1970, NAS 5-11735 MOD 3, Section II S/360 Job Control Statements and Catalogued Procedures.

3) System Procedure Library Listing. Available from the Science and Applications Computing Center, GSFC, Code 603.

CSC/SD-75/6015

EXPLORER 45 (S^3-A)
EXPERIMENTER TAPE DESCRIPTION

Prepared for
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
Goddard Space Flight Center
Greenbelt, Maryland

CONTRACT NAS 5-11999
Task Assignment 300

APRIL 1975

CSC

COMPUTER SCIENCES CORPORATION

CSC/SD-75/6015

EXPLORER 45 (S^3-A)

EXPERIMENTER TAPE DESCRIPTION

Prepared for

GODDARD SPACE FLIGHT CENTER

By

COMPUTER SCIENCES CORPORATION

Under

Contract NAS 5-11999
Task Assignment 300

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SECTION 1 - INTRODUCTION

The Explorer 45 (S^3-A), launched in November 1971, returned data until September 1974. All of the telemetry data for the seven scientific experiments onboard the spacecraft is contained in the Experimenter Tapes. Each Experimenter Tape contains the raw telemetry data for one S^3-A orbit along with other information to identify the quality, timing, and source of the data. To facilitate handling of the data by the experimenters, Experimenter Tapes were copied in groups of five to magnetic tapes of a higher density. The general format of these Condensed Experimenter Tapes is the same as that of the Experimenter Tapes.

The Experimenter Tapes are unlabeled, 9~~7~~-track, binary, odd-parity, ~~556~~ 6250-bpi density tapes generated on the UNIVAC 1108 computer. The Condensed Experimenter Tapes are standard-labeled, 7-track, binary, odd-parity, 800-bpi density tapes generated on the IBM 360 computer.

The general format of the Experimenter Tape is shown in Figure 1-1. The first file is a tape header. Following the tape header are the data files, one for each successive onboard flight program executed by the spacecraft.

Sections 2, 3, 4, and 5 describe the tape format. Section 6 describes the structure of the P2 data derived from the P2 Program--the major data collection program. Section 7 describes the Condensed Experimenter Tape.

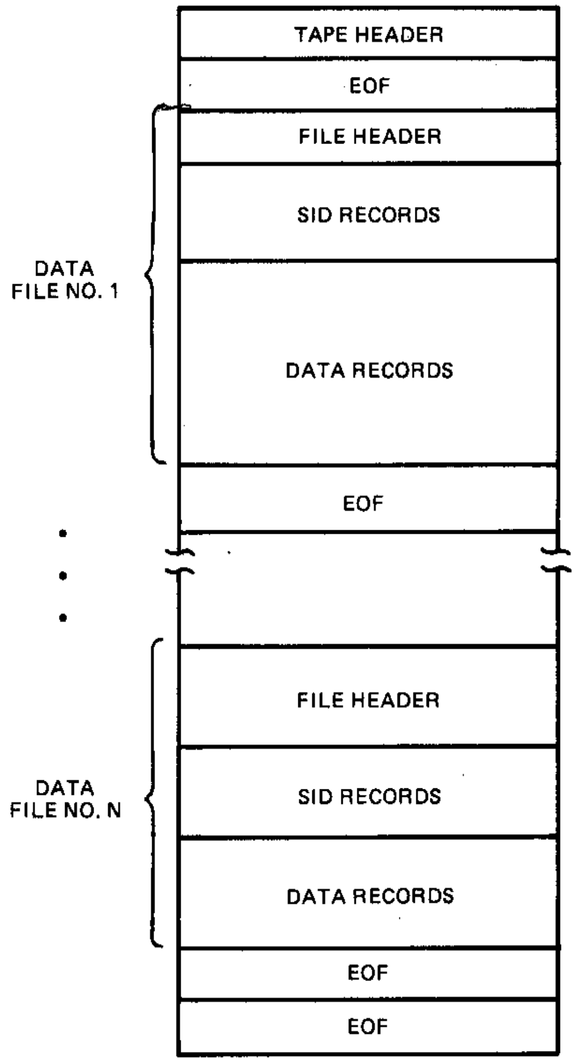


Figure 1-1. Experimenter Tape Format

SECTION 2 - TAPE HEADER

The tape header file consists of 20 UNIVAC 1108 36-bit words in BCD format. Descriptions for these words follow.

Word No.	Description (b = blank)
1	Satellite ID (SSS-Ab)
2	International ID (bddddd) (either 71999 or 71096)[1]
3	Tape processing date--year, month, day (yymmdd, e.g., 740630 corresponds to June 30, 1974)
4	Orbit number (bbnnnn)
5	Start year of orbit (bbbbyy)
6	Start day of orbit (bbbddd)
7, 8	Start time of orbit (milliseconds) (bmmmmm mmmbbb)
9	Stop day of orbit (bbbddd)
10, 11	Stop time of orbit (milliseconds) (bmmmmm mmmbbb)
12	Master edit tape number (AAnnnn)
13-20	Unused--blanks

[1] For S^3-A, the international ID assigned on 8/1/72 is 71096. All processing before this date used the interim ID of 71999.

SECTION 3 - FILE HEADER

Each file header consists of 20 UNIVAC 1108 36-bit words in binary format. Descriptions for these words follow.

Word No.	Description
1	Number of elements in the Sampling Identification Dictionary (SID)
2	SID creation or revision date (yymmdd)--internal BCD format
3	Number of analog tapes used in generating this file
4	Start day of year of this file
5	Start time of file (milliseconds)
6	Stop day of year of this file
7	Stop time of file (milliseconds)
8	SID program number corresponding to the specific onboard flight program--internal BCD format
9-20	Unused--blanks

SECTION 4 - SAMPLING IDENTIFICATION DICTIONARY (SID)

The general purpose of the SID is to indicate the type, timing, length, and source of data in the raw telemetry stream. The SID consists of multiple records of 1460 UNIVAC 1108 36-bit words. Each SID element is 60 bits in length. Each SID record thus contains 876 SID elements (except for the last record which may contain some padding at the end). The format of the SID block is shown in Figure 4-1. Descriptions for the elements follow.

SID Element	Description
SID(0)	"Half-elements" N and M are right-justified, 30-bit, binary count. N is the number of P1 SID elements in this particular SID; M is the number of P2 SID elements
SID(1)	First P1 SID element
.	.
.	.
.	.
SID(N)	Nth P1 SID element
SID(N+1)	First P2 SID element
.	.
.	.
.	.
SID(N+M)	Mth P2 SID element
SID(N+M+1)	Interrupt Sampling Subroutine (ISS) element 1, call 0
.	.
.	.
.	.
SID(N+M+64)	ISS element 2, call 3
SID(N+M+65)	Index Table element 1
.	.
.	.
.	.
SID(N+M+320)	Index Table element 256

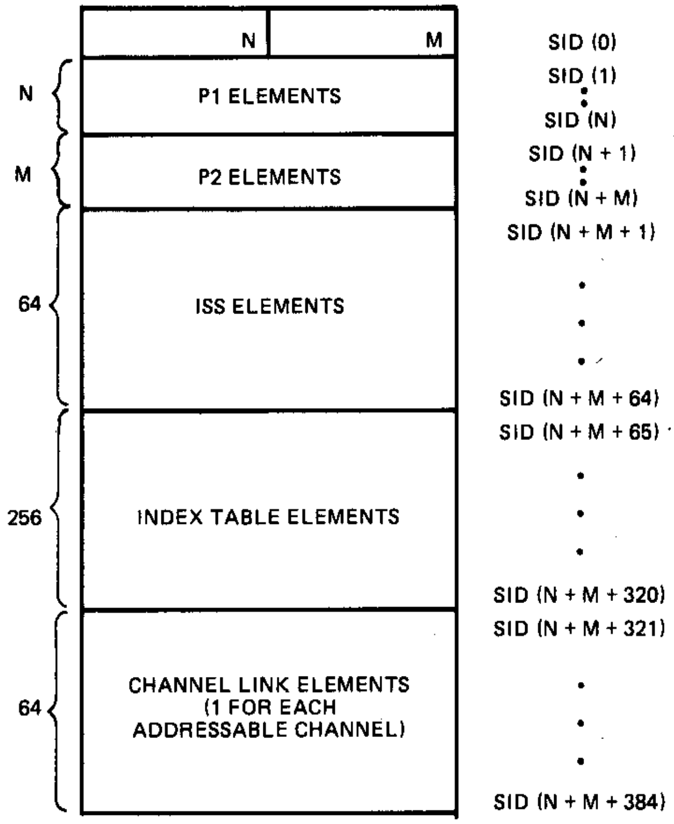


Figure 4-1. SID Block Format

SID Element	Description
SID(N+M+321)	Channel Link element 1
.	.
.	.
.	.
SID(N+M+384)	Channel Link element 64

4.1 P1 SID ELEMENTS

The P1 SID serves as a road map for the telemetry data of each telemetry frame. Each individual element defines the source and type of a specific portion of the telemetry stream, the branching condition, and the next SID element for the branch. The telemetry stream consists of all programmable bits of the telemetry frame. Each P1 SID element contains 60 bits. Bits 14 through 39, 59, and 60 are not used. Descriptions for the other bits follow.

4.1.1 Type Information (Bits 1-3)

Bit Configuration	Description
001	The data has been taken directly from an Addressable Channel by the P1 Program
010	The data has been taken from a Program Memory location by the P1 Program
011	The data has been taken from a DT1A, DT1B, DT2A, DT2B, COMON, P1XR, or P1SL storage location of the Buffer Memory by the P1 Program
100[1]	This entry indicates that the next 16 bytes of data have been fetched from the Buffer Area by the P1 Program

[1] This is P2 sampled data stored in the Buffer Area and fetched by the P1 Program. This bit configuration is the most common one.

Bit Configuration	Description
101	The data has been taken from a Data Table by the P1 Program (ISS fetch)
110	This entry describes a branch control function in the P1 Program

4.1.2 Source Information (Bits 4-11)

For each of the six element types, source information is given as described below.

Element Type	Source
001	The Addressable Channel number (0-63)
010	The Program Memory location (0-255)
011	A defined Buffer Memory portion corresponding to sources as follows:

0-15	DT1A
16-31	DT1B
32-47	DT2A
48-63	DT2B
64-95	COMON
96-103	P1XR
104-111	P1SL

100	N/A
101	The Data Table number (1-2)
110	N/A

4.1.3 Byte Count Information (Bits 12-13)

The byte count indicates the length of a particular data element in the telemetry stream. This count is independent of element type or source except for element type 100. For element type 100, the byte count is represented as 00, but a

16 hex-byte string is implied. For other elements types, data lengths are defined as follows:

Bit Configuration	Data Length (Hex-bytes)
00	4
01	1
10	2
11	3

4.1.4 Next SID Locator Information (Bits 40-55)

If the element type indicates a branch control function (110), these bits contain the index of the SID element to be branched to if the condition defined below is satisfied.

4.1.5 Branching Condition Information (Bits 56-58)

If a branch control function is indicated, these bits determine indirectly the condition to be met before branching is performed. Zero indicates an unconditional branch. Other branching conditions are specified in the following manner:

- For condition bit configurations 001, 010, 100, 101, 110 (values of 1, 2, 4, 5, 6), branch for value = N if the Nth bit in the 8-bit STATB word of the telemetry frame (location defined in Section 5.4.4) is equal to 1. Do not branch if bit N = 0
- For condition bit configuration 011, branch if the 3rd bit in the 4-bit STATA word of the telemetry frame (location defined in Section 5.4.4) is equal to 0. Do not branch if bit 3 = 1

4.2 P2 SID ELEMENTS

The P2 SID elements indicate the source and type of data elements from the P2 Program, the corresponding length and storage locations in the telemetry frame, and the index of the SID corresponding to the next P2 SID element describing the same source as the current one. Each P2 SID element contains 60 bits. Descriptions for these elements follow.

4.2.1 Type Information (Bits 1-3)

The type of information in each data element is indicated by the bit configuration as described below.

Bit Configuration	Description
001	The data has been taken from an Addressable Channel.
010	The data has been taken from a Program Memory location
011	The data has been taken from a Buffer Memory location

4.2.2 Source Information (Bits 4-11)

For each of the three element types, source information is given as described below.

Element Type	Source
001	An Addressable Channel number (0-63)
010	The Program Memory location (0-255)
011	A defined Buffer Memory portion corresponding to source, as follows:

64-95	COMON
112-119	P2XR
120-127	P2SL

4.2.3 Byte Count Information (Bits 12-13)

The length of a particular data element is indicated by the bit configuration as follows:

Bit Configuration	Data Length (Hex-bytes)
00	4
01	1
10	2
11	3

4.2.4 Timing Information (Bits 14-23)

These bits indicate the relative timing of data sampling within a given P2 cycle. When the data timing is synchronized to the "spacecraft clock," these bits range from 0 to 1023, effectively dividing the P2 Program cycle into 1024 time segments.

When the data timing is synchronized to the "data-sync-clock," these bits also range from 0 to 1023, but they divide the roll period of the satellite into 1024 segments (half-subsectors). Individual bits also take on added significance as follows:

- Bits 14-18 contain the sector time of data sampling (0-31)
- Bits 19-22 contain the subsector time of data sampling (0-15)
- Bit 23 contains the half-subsector time of data sampling (0-1)

4.2.5 Telemetry Location Information (Bits 24-39)

These bits indicate the specific telemetry stream locations of individual data elements.

- Bits 24-31 contain the P2 data frame count (DFC) number of this element. (A P2 data frame is equivalent to 256 bytes of P2 data. Hence, DFC should not be confused with the actual frame count.)

The DFC may range from 0-255, though it normally recycles before 30

- Bits 32-35 contain the Block number within a given data frame for this data sample (0-15)
- Bits 36-39 contain the Byte number within a given Block for this data sample (0-15)

The three locators, DFC, Block, and Byte number define uniquely the location of data within any particular P2 data stream.

4.2.6 Next-Entry Locator Information (Bits 40-55)

The value of these 16 bits defines the next SID index which contains P2 sampling information for an element of the same source and type. If this source element is sampled only once during an entire P2 sequence, the SID index pointed to is the same as the SID entry currently in use.

4.2.7 Condition Information (Bits 56-58)

These bits contain conditions to be met before the current SID element is to be considered valid. Normally, all three bits are zero, and the SID element is to be unconditionally accepted. If any one of these bits is nonzero, the logic level (0 or 1), obtained from the most recent sampling of Addressable Channel 36, must equal the logic level value of the Condition Status Bit (SID element bit 59) before the SID element is to be accepted.

4.2.8 Condition Status Information (Bit 59)

This bit holds the logic level value (0-1) necessary for validation of this SID element.

4.2.9 Synchronization Information (Bit 60)

This bit specifies to which clock the spacecraft is synchronized. Generally, this bit is constant for all P2 SID elements in a particular onboard flight program.

- Bit = 0, data sampling synchronized to the data-sync-clock (DSC)
- Bit = 1, data sampling synchronized to the spacecraft clock (S/CC)

4.3 INTERRUPT SAMPLING SUBROUTINE (ISS) ELEMENTS

There are 64 ISS elements grouped in eight similarly structured groups of eight elements, one group for each ISS call. ISS 1 calls 0, 1, 2, 3; ISS 2 calls 0, 1, 2, 3. The first entry in each group contains a right-adjusted count (from 0 to 7) of the number of samples taken by that call. A zero count indicates that no samples were taken. For a given binary count N, where $N \leq 7$, the next N entries contain sampling information--the remaining (7 - N) entries equal zero.

Each ISS element contains 60 bits. Bits 14 through 60 are not used. Descriptions for the others follow.

4.3.1 Type Information (Bits 1-3)

These bits always contain 001, referring to data taken from an Addressable Channel.

4.3.2 Source Information (Bits 4-11)

These bits contain the Addressable Channel number, right-justified. Values range from 0 to 63.

4.3.3 Byte Count Information (Bits 12-13)

These bits describe the byte count of the data sample as follows:

Bit Configuration	Byte Count (Hex-bytes)
01	1
10	2
11	3

4.4 INDEX TABLE ELEMENTS

There are 256 Index Table elements, each of which points to a P2 portion of the SID. The ith Index Table element points to the first SID element in the P2 SID which has a Data Frame Count (DFC) of (i - 1). If the DFC of the P2 Program recycles before reaching 255, all subsequent corresponding entries in the Index Table elements are 0. Thus the first Index Table element indicates the SID index of the P2 element having a DFC of zero. Each element is 60 bits in length. Bits 1 through 44 are not used. Bits 45-60 contain the SID element index, right-justified.

4.5 ADDRESSABLE CHANNEL LINK ELEMENTS

There are 64 Addressable Channel Link elements corresponding sequentially to the Addressable Channels 0 to 63. For any Addressable Channel j the value of Channel Link element (j + 1) denotes the P2 SID element (as an ith element of the SID) in the P2 Program cycle which corresponds to the first sample of that Addressable Channel in the present Data File. A value of zero indicates that this particular Addressable Channel is not sampled by this flight program. There are 60 bits in each element. Bits 1 through 44 are not used. Bits 45-60 contain the SID element index, right-justified.

SECTION 5 - DATA BLOCK

The Data Block contains multiple physical records of 1460 UNIVAC 1108 36-bit words. The format for each record is the same and is described in Figure 5-1. The first three 36-bit words contain information for the particular record. Following these words there are up to 32 contiguous groups of 45 36-bit words. Each group of 45 words corresponds to a data frame (not to be confused with a P2 Data Frame). Words 1444-1460 are padded words. If the number of data frames is less than 32, the appropriate words at the end of the record are padded with ones.

5.1 RECORD HEADER

The record header contains one word. Descriptions for the bits follow.

Bits	Description
1-12	Two 6-bit "zero characters" (in 7-track BCD format)
13-24	The number of valid data frames for this record-binary count
25-36	Record number (1-8) of this logical record (the physical record count recycles for groups of eight)--binary count

5.2 ROLL START TIME

This word contains the time in milliseconds of the start of the first identifiable spacecraft roll in this physical record (binary form).

5.3 ROLL STOP TIME

This word contains the time in milliseconds of the start of the second identifiable spacecraft roll in this physical record. (Thus effectively providing the first roll stop time in binary form.)

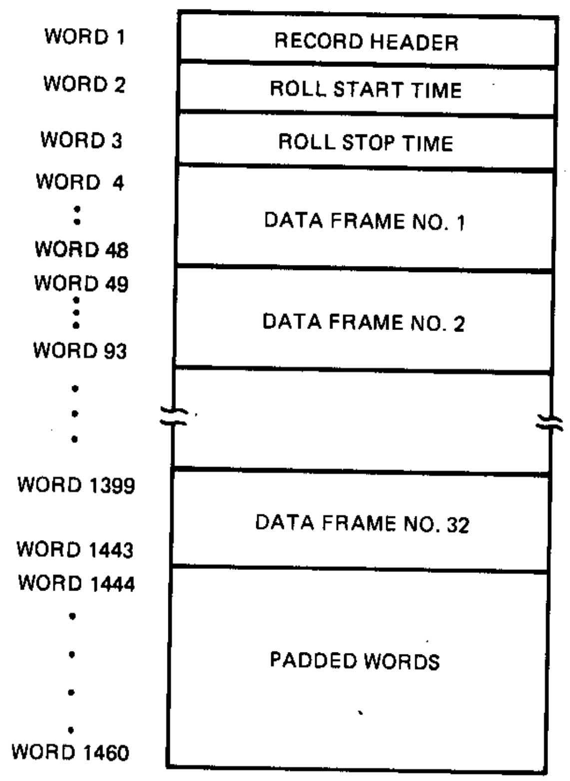


Figure 5-1. Data Record Format

5.4 DATA FRAME

Each data frame consists of 270 6-bit characters (see Figure 5-2). The first 14 characters are supplied by Ground Data Processing. The 256 4-bit words of the telemetry frame are embedded, right-adjusted, into the 256 6-bit characters. Thus, the first two bits of these 256 characters are meaningless (always zero).

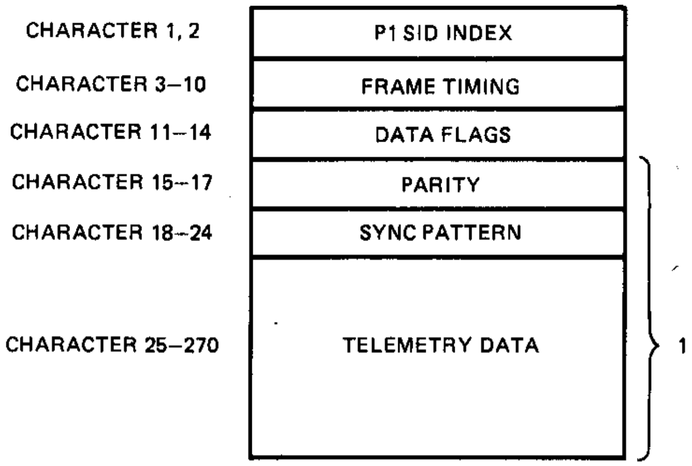
5.4.1 P1 SID Index (Characters 1-2)

These characters contain the P1 SID index to be first used in decommutating the telemetry data (right-adjusted).

5.4.2 Frame Timing (Characters 3-10)

Description of information contained in the 48 bits follows.

Bits	Description
1-8	If the spacecraft is synchronized to the data sync clock, these bits represent the roll count. If the spacecraft is synchronized to the spacecraft clock, these bits indicate the cycle count
9-12	These bits indicate the number of valid P2 blocks of data in this telemetry frame
13-21	The day of the year (right-adjusted) of the receipt on the ground of the first bit of byte 12 in the telemetry frame (see Figure 5-3) of this data frame
22-48	The time in milliseconds of the day corresponding to receipt on the ground of the above-mentioned bit



[1]THESE 256 BYTES COMPOSE THE ACTUAL TELEMETRY FRAME RECEIVED FROM THE SPACECRAFT (SEE FIGURE 5-3).

Figure 5-2. Data Frame Format

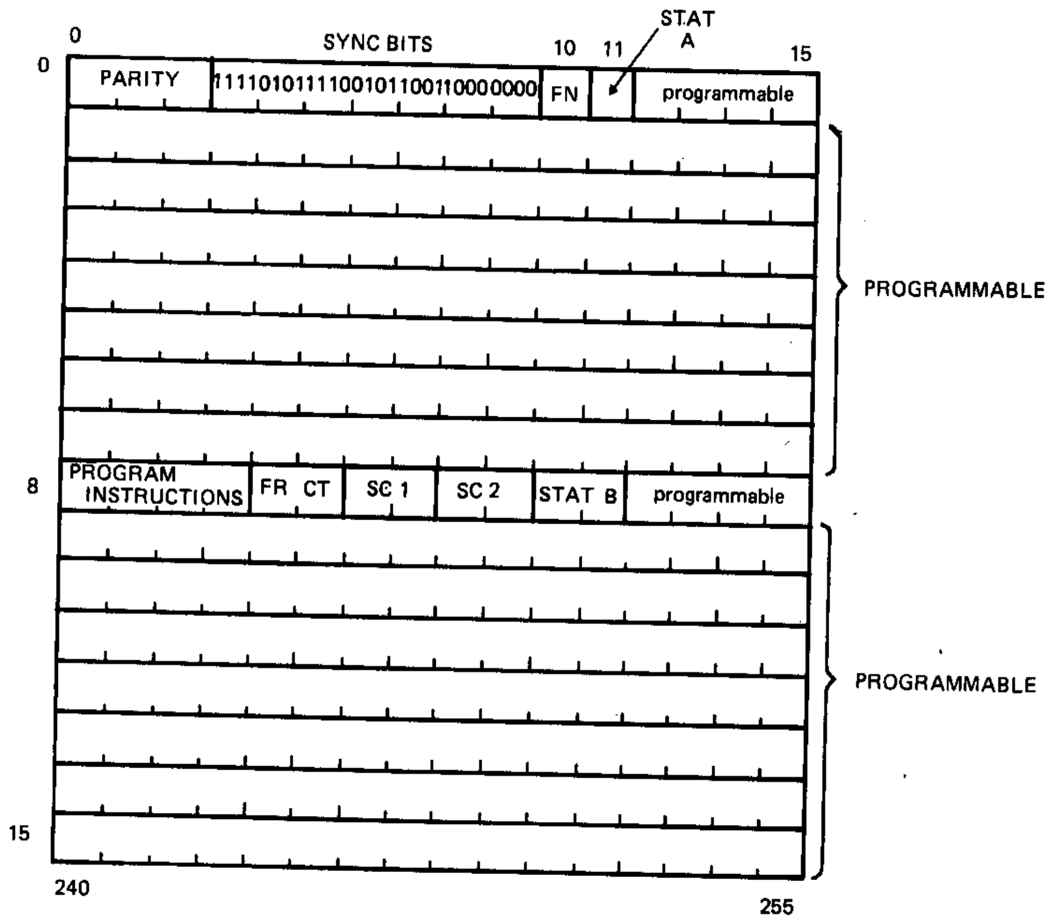


Figure 5-3. S^3-A Telemetry Frame

5.4.3 Data Flags (Characters 11-14)

Descriptions of the data flags follow.

Character	Bit	Description
11		Data Flags
	1	Smooth frame counter
	2	Smooth GMT
	3	BCD = ACC
	4	BCD in sync
	5	Parity
	6	First frame after a data dropout

NOTE: Bits 1 and 2 of Character 11 are on if the respective item has been smoothed. Bit 3 is on if the accumulator register no longer equals the BCD time register. Bit 4 is on if the time decoder is no longer in sync with the BCD register. Bit 5 is on if there is a parity error in this frame. Bit 6 is on if this is the first frame after a data dropout. It will be on if edited frames are missing.

Character	Bit	Description
12		Data Flags
	1-5	Number of frame sync errors
	6	Dropout bit
13, 14	-	Data Flag. Number of missing edited frames--binary count

5.4.4 Telemetry Frame (Characters 15-270)

The telemetry frame consists of the 256 bytes (hex-bytes) which are received from the spacecraft by Ground Data Processing (see Figure 5-3). The bits reserved for sync are hard-wired, i.e., they remain unchanged for all S^3-A Flight Programming. Other bytes of information are variable, but for several specific locations the type of information remains the same. These are defined below. The remaining 232 bytes make up the telemetry stream. The contents of these bytes are programmable and vary with the onboard flight program. Information regarding these bytes is provided by the P1 SID. Generally, one cycle of the P1 SID maps each telemetry frame.

Each 4-bit byte of information in the telemetry frame is embedded, right-adjusted into a 6-bit character on the experimenter tape. Descriptions follow.

Bytes	Description
0-2	Parity information. The parity word is a full frame, distance 4, cyclic error detection code for Gaussian noise and burst errors. The position of these 12 bits is fixed for all S^3-A flight programming and will detect all 3 or fewer random errors and all burst errors of size 11 or smaller.
3-9	Sync Word. The 28 significant bits are fixed for all S^3-A flight programming and are in keeping with GSFC standards. For S^3-A they are: 1111 0101 1110 0101 1001 1000 0000
10	Format Number (FN). The format number (0-15) corresponds to the flight program used by the spacecraft in producing the present telemetry frame. Each onboard flight program has only one format number, but because the number of flight programs exceeds 16, the same format number may correspond to more than one flight program.
11	Stat A. The bits in the Stat A word hold information regarding branch control functions in the P1 SID.
12-127	Programmable Bytes. The substance of these bytes varies, depending upon the onboard flight program in process at the time of this telemetry frame. The contents are determined by elements of the SID.
128-131	Program Instructions. To verify the correctness of the flight program in the program memory, the program memory is read sequentially, 4 bytes per telemetry frame. The cycle requires 256 readouts in 256 telemetry frames for each complete readout of the program memory. This cycle is repeated for the duration of each flight program.
132-133	Frame Count (FRCT). These two bytes contain the frame count (0-255) of this telemetry frame. The frame count is further broken down into a group of eight logical records (numbered 1 through 8). Thus, frames 0-31 make up logical record 1, frames 32-63 make up logical record 2, ..., and frames 224-255 make up logical record 8. A recycling of the frame count indicates a recycling of a group of logical records. (The frame and logical record counts are

Bytes	Description
132-133 (Cont'd)	synchronized to time; hence, data gaps will be reflected by the respective counts.)
134-137	Subcom Channel 1, Subcom Channel 2, (SC1, SC2). There are 128 subcom channels processed by S^3-A independent of the flight program. They are A01, A02, ..., A64 and B01, B02, ..., B64. The spacecraft values for subcom channels A01-A64 are found in bytes 134-135 (SC1). The spacecraft values for subcom channels B01-B64 are found in bytes 136-137 (SC2). Only two subcom channels are sampled per telemetry frame, an "A" subcom channel with its corresponding "B" subcom channel (e.g., A13 with B13, etc.). The channels are sampled sequentially in pairs (A01, B01; A02, B02; ...; A64, B64) and this cycle is repeated 4 times for every group of 8 logical records. The subcom channels sampled during any given telemetry frame are determined, from the telemetry frame count, as follows: If n = telemetry frame count, let $j = (n \bmod 64) + 1$. For telemetry frame number n, subcom channels Aj and Bj are sampled.
138, 139	Stat B. The bits in the Stat B word hold information regarding branch control functions in the P1 SID.
140-255	Programmable Bytes. The type and content of these bytes depends on the flight program in process at the time of this telemetry frame. As with Bytes 12-127, their content is determined by the SID.

SECTION 6 - P2 DATA STRUCTURE

The P2 Program is the major data collection program on the spacecraft. This program samples data from various sources (see Section 4. 2) and stores it in the Buffer Area from where it is fetched by the P1 Program. P2 sampled data is indicated if, and only if, a P1 SID element indicates that the next 16 bytes in the telemetry stream have been fetched from the Buffer Area (Type 100, see Section 4.1.1).

The P2 Program cycle is divided into P2 data frames whose count may range from 0 to 255 (though the program cycle normally requires no P2 data frame count higher than 30). Each P2 data frame is equivalent to 256 bytes of P2 data, and is further subdivided into 16 P2 blocks, numbered 0 through 15, each of length 16 bytes. The bytes within each block are also numbered 0 through 15. Thus, a P1 indication of P2 sampled data also indicates that a block of P2 data is present. Byte 0 of this block defines the remaining 15 bytes (with the 4 bits defined left to right) as follows:

- Bit 1 is on if this P2 data was collected in the calibrate mode; otherwise, bit 1 is off.
- Bit 2 is on if the data collection is synchronized to the data-sync clock, and off if collection is synchronized to the spacecraft clock.
- Bit 3 is on if there is valid data in the following bytes of this block. If it is off, this block is not considered a valid P2 block.
- Bit 4 is on every 16th valid P2 block (except at the end of a P2 Program cycle). It indicates that (a) the P2 data frame count has changed (thus P2 block number = 0), (b) bytes 1 and 2 contain the new P2 data frame count, right-adjusted, and (c) bytes 3-15 contain valid P2 data. If bit 4 is off, the next 15 bytes contain valid P2 data (unless, of course, bit 3 is off).

SECTION 7 - THE CONDENSED S^3-A EXPERIMENTER TAPE

The Condensed S^3-A Experimenter Tape is a standard labeled, 7-track, binary, odd-parity tape written with an 800-bpi density, and having a data set name (DSN) of EXPTAPE. The condensed tapes are generated on the IBM S/360 computers. Data from five (usually) or fewer orbits are contained on each tape. These orbits are "back-to-back," that is, without intervening header or trailer records except for the header and trailer files normally associated with an S/360 standard-label tape. They have the same form and content as the S^3-A Experimenter Tape described in Sections 2 through 6. Figure 7-1 describes the format of the Condensed Experimenter Tape. For each orbit of data, there is a tape header file, followed by the data files. The standard label on each condensed tape corresponds to a volume-serial number of the form W20nnn, where nnn ranges from 001 to 300 and specifies the S^3-A orbits present on the tape as follows: condensed S^3-A Experimenter Tape W20nnn contains, in order, orbits 5·nnn-4, 5·nnn-3, 5·nnn-2, 5·nnn-1, and 5·nnn. Thus, condensed tape W20113 would contain orbits 561, 562, 563, 564, and 565. An orbit of data is missing from a Condensed Experimenter Tape if the Project Scientist's office determined that a problem existed with the original Experimenter Tape.

not true

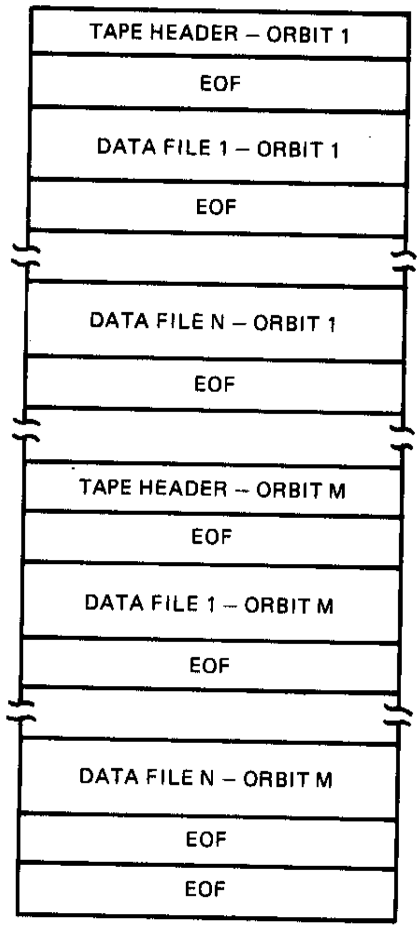


Figure 7-1. Condensed Experimenter Tape Format

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REPLY TO
ATTN OF: Code 626

January 5, 1976

MEMORANDUM

TO: E. G. Stassinopoulos, Code 601.1
S^3 Coordinator, NSSDC

FROM: Paul H. Smith, Code 626
S^3 Software Coordinator

SUBJECT: S^3 Software Documentation

Enclosed are two copies of the X-document "Software Systems for Explorer 45 (S^3-A) Data Analysis" which we recently completed. It primarily describes the Quick Look and Summary Plot Programs and their output. Microfilm copies of this output are being submitted to the National Space Science Data Center, as you know. This document also describes other programs which we have been using for the particle data analysis.

If you would like any additional copies of this document, please let me know.

Paul H. Smith

Enclosures

X-626-75-286

SOFTWARE SYSTEMS FOR EXPLORER 45 (S^3-A) DATA ANALYSIS

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NOVEMBER 1975

GSFC — GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND

SOFTWARE SYSTEMS FOR EXPLORER 45 (S^3-A) DATA ANALYSIS

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Greenbelt, Maryland 20771

(Telephone 301-982-4488)

I. Introduction

This document describes several of the software systems and various computer plot and utility programs used in the data analysis of Explorer 45 (S^3-A) measurements. The Summary Plot Program described in section II provides data from all the scientific instruments on the satellite in a unified format at the rate of one data value per minute for an entire orbit. The Quick Look Program described in section III provides a very detailed review of the data in tabular or plotted form. Each individual measured value for the time period of interest is either plotted or listed. The Energy Density Program (section IV) computes particle flux and energy density for more specific analyses of the particle data. The Specialized Utility Programs described in section V are used to supplement the output options of the Energy Density Program. The Energy Level Program (section VI) is used for analysis of the data from the second half of the life time of the S^3 observations where special effort is required to determine the specific energy levels of the particle detectors.

Additional information concerning the Explorer 45 (S^3-A) mission, satellite instrumentation, ground data processing and other general items is contained in the documents listed in the bibliography (section VII). The list of the on-board addressable data channels is given in Appendix A. The energy bands and frequency bands of the detectors is given in Appendix B. Appendix C describes the spacecraft coordinate system.

II. Summary Plot Program

The Summary Plot Program is a complex system of computer programs handling large amounts of telemetry data and performing detailed data-analysis-level calculations while yet remaining flexible enough to service the large variety of On-Board Flight Programs used for Explorer 45 (S^3-A). The Summary Plot Program processes data from all the S^3-A instruments and provides SD-4060 microfilm plots as output. The program performs the following functions: (a) calculates particle flux for 49 energy bands from the Solid State Proton, Channeltron, and Solid State Electron detectors and displays the results in energy-time gray shaded spectrogram form; (b) calculates differential energy density for both electrons and protons at 90^0 pitch angle from all the particle detectors; (c) determines frequency-time spectral intensities for the 16 AC-Electric Field frequency bands and the 14 Search Coil Magnetometer frequency bands; (d) computes the difference between the magnitude of the measured magnetic field and a predicted model magnetic field and compares the two field angles with the angles predicted by the model; and (e) calculates the DC-Electric Field including $\vec{v} \times \vec{B}$. The energy bands and the frequency bands for the detectors are given in Appendix B.

Each of the S^3-A Summary Plots, shown in Figures 1 and 2 are for three and one-half hours of S^3-A data, which covers approximately one-half of an orbit. The other half of the orbit is contained on two additional plots of identical format. All data except the DC-E Field, $|Bm|-|BREF|$, INC and DEC are one-minute averages of data selected as close as possible to the time of the x-axis magnetometer "zero field" measurement (this corresponds to the 90^0 pitch angle for the particle detectors). The Electric Field, Magnetic Field, Electron Flux and Proton Flux are shown as time-frequency or time-energy spectrograms with a gray shading to indicate intensity.

The Electric Field is measured by the AC-E Field Experiment and the DC-E Field Experiment. The AC-E Field Experiment samples 16 filters sequentially to produce data in 15 narrow frequency bands with the center frequencies ranging from 35 Hz to 100 kHz and a wide band from 150 Hz to 10 kHz. While these filters are always sampled sequentially for each measurement set, the time interval between measurements may vary according to the On-Board Flight Program used in the spacecraft. In order to obtain all 16 frequency bands, the plot program collects 16 telemetry values centered as closely as possible to 90^0 pitch angle. After collecting data over one minute, an average is calculated for each frequency and the intensity is plotted. Three of the four band passes of the DC-E Field Experiment, (a) 1.0-3.0 Hz, (b) 3.0-10.0 Hz, and (c) 10.0-30.0 Hz, are used in the low frequency portion of the Electric Field display. The fourth band (0.3-1.0 Hz) is not plotted in the current version of the program. The time interval between these measurements is usually large (4 or 8 seconds) and the pitch angle at the time of the selected points may vary widely from 90^0.

The Electric Field is shaded according to the table below.

Electric Field, E Absolute Calibration (μ volt/meter)	Plot Shade
$E < 0.984$	0
$0.984 \leq E < 2.56$	1
$2.56 \leq E < 6.65$	2
$6.65 \leq E < 17.3$	3
$17.3 \leq E < 45.0$	4
$45.0 \leq E < 117.$	5
$117. \leq E < 304.$	6
$304. \leq E < 791.$	7
$791. \leq E < 2055.$	8
$2055. \leq E$	9

The x-axis Magnetic Field is measured by a search coil magnetometer with a range from 1.0 to 3000 Hz in 7 bands. Each band is telemetered by a different addressable channel and thus data are collected simultaneously for the 7 different bands. The time interval between measurements may vary depending on the On-Board Program but is usually large (2 to 4 seconds). The plot program collects only data which is within 1 second of 90^0 pitch angle but even with that restriction the actual pitch angle may be much different than 90^0. The 'piano keys' effect exhibited in the Magnetic Field spectrogram is due to a change in instrument sensitivity every minute for which the plot program cannot normalize. The z-axis Magnetic Field data display description is exactly as the x-axis.

The encoded gray shading is determined by the following table.

Telemetry Value, V (volts)	Plot Shades
$0.00 \leq V < 0.50$	0
$0.50 \leq V < 1.00$	1
$1.00 \leq V < 1.50$	2
$1.50 \leq V < 2.00$	3
$2.00 \leq V < 2.50$	4
$2.50 \leq V < 3.00$	5
$3.00 \leq V < 3.50$	6
$3.50 \leq V < 4.00$	7
$4.00 \leq V < 4.50$	8
$4.50 \leq V < 5.00$	9

The DC-E Field displayed is approximately 1/9 of the data from the static field portion of the DC-E Field Experiment. The data are plotted point by point for the first 8 seconds of a 73 second interval. For some On-Board Programs, the sample time of these data is halved and then the plot shows only every other point sampled during the first 8 seconds of the 73 second interval.

The quantity $|Bm| - |BREF|$ is the measured magnetic field minus the model or reference magnetic field. This value is calculated and plotted once each minute for simultaneous three axis measurements by the flux gate magnetometers.

To calculate the measured B field, B_m, the telemetry values of the x-, y-, and z-axis magnetometers are converted to Bx, By, and Bz in units of gammas by means of a calibration table. For the orbit(s) of interest a fit is used to determine the zero levels. Then Bm is calculated by $B_m = (B_x{}^2 + B_y{}^2 + B_z{}^2)^{\frac{1}{2}}$. The POGO (8/69), Epoch 1969.0 (Cain and Sweeney, JGR, 1970) magnetic field model, B_{REF}, is available from the definitive orbit/attitude tape.

The quantities INC, DEC are the measured inclination and declination of the magnetic field (Mead and Cahill, JGR, 1967). These are calculated from the magnetometer data in the spacecraft reference frame and from the spatial coordinates of the spacecraft at this specific time. The inclination and declination of B_{REF} are plotted as solid lines.

The L-value, Magnetic Local Time (MLT) and Magnetic Latitude (MAG. LAT.) are read from the definitive orbit/attitude tape. L-value is indicated by an arrow every earth radius and by a vertical line segment every 1/10 earth radius. Apogee is indicated by the arrow plotted next to an 'A'.

The lower energies (0.73 keV to 30.2 keV) of the Proton and Electron Flux (shown in Figure 2) were measured by electro-static analyzers with channeltron detectors which cover this energy range in either 8 or 16 steps. In an 8-step sequence, the plot program covers the missing energy bands with the data from the next higher level. The particle detectors accumulate counts over a time interval specified by the On-Board Program. This time interval usually is about 0.262 seconds during which time the pitch angle may vary approximately 11^{0}. Thus, the data displayed is accumulated over a pitch angle range from 78^{0} to 90^{0}. However, at times the accumulation time may be smaller or larger, in which case the lower end of the pitch angle range is closer to or farther from 90^0. The flux is calculated according to:

$$\text{flux} = \frac{\dfrac{\sum (\text{counts}/(dt*G*dE*e))}{\text{one minute}}}{\text{number of terms in the sum}}$$

where dt is the accumulation time (seconds)

G is the geometric factor (cm^2 - ster)

dE is the energy interval accepted by the detector (keV)

e is the efficiency of the detector (counts/particle)

Thus the units of Electron and Proton Flux are particles/(cm^2*ster*sec*keV).

The gray shading corresponds to flux values as follows:

Flux, J	Plot Shade
$J < 3.16 \times 10^2$	0
$3.16 \times 10^2 \leq J < 1.58 \times 10^3$	1
$1.58 \times 10^3 \leq J < 7.94 \times 10^3$	2
$7.94 \times 10^3 \leq J < 3.98 \times 10^4$	3
$3.98 \times 10^4 \leq J < 2.00 \times 10^5$	4
$2.00 \times 10^5 \leq J < 1.00 \times 10^6$	5
$1.00 \times 10^6 \leq J < 5.01 \times 10^6$	6
$5.01 \times 10^6 \leq J < 2.51 \times 10^7$	7
$2.51 \times 10^7 \leq J < 1.26 \times 10^8$	8
$1.26 \times 10^8 \leq J < 6.31 \times 10^8$	9

The P.A. (Pitch Angle) Parameters are the ratios

$$\frac{\text{flux at } 90^0 \text{ P.A. (averaged over one minute)}}{\text{flux at } 30^0 \text{ P.A. (averaged over one minute)}}$$

for protons and electrons for data from two selected energy intervals. The interval indicated by 9 keV extends from 8.5 to 10.3 keV and the interval indicated by 50 keV extends from 50 keV to 78 keV. The pitch angle at the time the data were collected actually varies from 90^0 as was described above in the discussion of Proton and Electron Flux.

The Differential Energy Density is an integration over energy (approximated by sums) using the minute averages of flux calculated for the Proton and

Electron Flux. Hence, it is the energy density measured as close to 90^{o} pitch angle as possible. The Differential Energy Density for a particular time, T, is then

$$\frac{\text{flux } (E_0(EN),\ T)*E_0(EN)*EN*1.61*10^{-9}}{V_0(EN)}$$

where:

EN is the energy interval over which this term is integrated (keV).

$E_0(EN)$ is the center energy of the detector (keV/particle)

flux ($E_0(EN)$, T) is the flux at energy $E_0(EN)$ and time T used for this term (particles/cm^2*ster*sec*keV)

V_0 (EN) is the velocity of particles with energy $E_0(EN)$ (cm/sec)

$1.61 * 10^{-9}$ ergs/keV is a constant to convert from keV to ergs.

At a time T, if a flux value for a particular energy is missing, a value is used which is the midpoint of the 2 adjacent energy flux values. If more than three of the expected energy levels are missing, the point is not plotted. The energy interval for the electron integration is from 0.7 to 405. keV and for the proton integration it is from 0.7 to 872. keV.

III. The Quick-Look Plot Program

A. GENERAL

The Quick-Look Plot Program is designed to enable the user to analyze in detail data from the S^3-A satellite. Each of the five versions of this program (A, B, C, D, and R Versions) place an emphasis on various types of data sampling; however, all are similar in their general characteristics.

This program generates time listing in tabular form and/or time plots of the raw data values. The units on these outputs for particle data are counts/readout while other data values are indicated in volts, except as otherwise noted.

1. Sampling Scheme

The sampling scheme for each version of the Quick-Look Program is the same. The time span requested by the user is divided into three-minute segments, which are processed independently. These three-minute segments are further subdivided into 6 sub-segments of 30 seconds each. At every 30 second interval, the Quick-Look Program supplies the user with three predicted orbital parameters: the L-value, the Magnetic Local Time (MLT) and the Altitude in kilometers. Telemetry data are processed and supplied to the user at the rate of the most frequently sampled spacecraft channel. Normally, this rate does not exceed 2 samples per sector or 64 times every spacecraft roll.

2. Tabular Output

Tabular output for each version of the Quick-Look Program is available on either computer printout, on microfilm or on both. There will be up to 5 three-minute tables containing different types of information for each three-minute interval processed. Except for the rapid sample data of Version R which is output in groups of spacecraft rolls, these tables are of the same form (see Figure 3). A general orbit heading describing a particular interval is printed at the top of each table once in 3 minutes. It contains information about the S^3-A orbit: its number; the year, month, day and minute timing; the On-Board Flight Program used by the satellite; the clock sync of the On-Board Flight Program (data sync clock or spacecraft sync clock); the spacecraft roll period; and the type of data that is to be output following the heading. The tabular output is then printed out in "blocks" of 30 seconds. A table subheading is also output every 30 seconds with the start-time of the 30 second block and the predicted orbital parameters described in subsection A.1. above. Within each block of 30 seconds a line of print is allocated based on the most frequently sampled spacecraft channel. The spacecraft sector (0-31) and its associated time (relative to the 30 second block start time) are always output. Corresponding data values from various spacecraft channels are output under their respective column headings and on the line-level associated with its correct sampling time. If data gaps exist, the data and time are not output, but a line of print is none-the-less allocated in the table. The tabular output contains all data processed by the Quick-Look Program.

3. Plotted Output

The plotted output is available on microfilm only. The output consists of from four to six frames (depending on the version) for each three-minute interval (see Figures 4-7). Each frame may contain from three to sixteen graphs, and some graphs may have one or more ordinate scales, depending on the type of data plotted. The graph of the Solid State Proton Detector (SSPD) shown in Figure 5 is such an example. Four separate scales exist - one for each digital energy level plotted. The scales pertaining to a particular level (and symbol) are located above or below the digital symbol key.

Except for rapid sample data (Version R), which is plotted over a four-roll time segment, the abscissa represents a three-minute segment for all graphs on a frame. Information at the top of each frame defines the S^3-A orbit number, the date of the orbit, the On-Board Flight Program in process at that time, and whether data collection was synchronized to the spacecraft clock or the data sync clock. Information at the bottom of each frame relates the type of data plotted, the type of measurement to which the ordinate values refer, and the time of data sampling. Predicted orbital parameters are also supplied at 30 second intervals.

Most of the printed data also appears in the plotted portion with the following exceptions:

a. gain and bias information from channel 0.

b. data from channels 2, 35 and 43.

c. P1 data from channels 57-58 if both P1 and P2 data are present.

d. data from subcom channels 102-107 and 241.

P1 data are sampled in synchronization with the S/C telemetry and are not immediately inserted into the telemetry stream. P2 data are sampled asynchronously to the telemetry stream and are temporarily stored in an on-board buffer memory.

B. VERSION A

This version of the Quick-Look Program processes P2 data from all of the program channels except for DC*50 and DC*100 (channels 9 and 10, respectively), rapid sample data (channels 28-30), spacecraft clock (channels 32-34), the condition bits (channel 36) and star and sun data (channels 61-62). It also processes P1 data from channels 40 and 57-58 and subcom channels 102-107, 123-124 and 241. The emphasis is not on any particular experiment, but rather provides a general data format.

Version A is capable of processing data from On-Board Flight Programs: 501F; 502I; 521A, B; 522B; 525A, B, C, D; 527A, B, C, D, E; 535A, B, C, D; 565A; 567A, B.

Tabular and plotted outputs for this version are described in Table 1.

C. VERSION B

This version emphasizes particle data and DC field data. Only P2 data are processed. Version B is capable of processing data from flight programs: 521A, B; 522B, C; 524A; 525A, B, C, D; 527A, B, C, D, E; 535A, B, C, D; 544A, B; 563A, B; 564A, B, C; 565A; 567A, B; 571A, B; 572A; 574A; 575A; 601B.

Tabular and plotted outputs for this version are described in Table 2.

D. VERSION C

This version emphasizes the Solid State Proton Detectors and the DC fields. Only P2 data are processed.

Version C is capable of processing data from flight programs: 545A, B, C, D, E, F.

Tabular and plotted outputs for this version are described in Table 3.

E. VERSION D

This version emphasizes particle data obtained by the channeltron and solid state detectors. It has additional capability to process buffer memory channel 71, the spacecraft roll counter. This version processes solely P2 data and is capable of processing data from flight programs: 563A, B; 564A, B, C; 571A, B; 572A, B; 574A; 575A; 601B.

The tabular and plotted output for this version is described in Table 4.

F. VERSION R

This general purpose version is similar to Quick-Look Version A with an additional emphasis on the rapid-sample magnetic field data of channels 28-29 and 40-42. Both the tabular and plotted output for the rapid sample data are divided into spacecraft rolls rather than the normal half-minute intervals.

This version is capable of processing data from flight programs: 529A, B; 547A; 549A, B.

The tabular and plotted output for this version is described in Table 5.

TABLE 1

VERSION A: On Board Flight Programs 501F; 502I; 521A, B; 522B; 525A, B, C, D; 527A, B, C, D, E; 535A, B, C, D; 565A; 567A, B.

Tabular Output:

"Page"#	Type of Data	Spacecraft Channels
1	Channeltrons	1-2, 48-49, 57-58 (P2&P1), 123-124 (subcom)
2	Solid State Electron and Proton Detectors	0, 4, 5, 50-56
3	DC Electric and Magnetic Fields and $\lvert\vec{B}\rvert$	8(P2 only), 11-14, 40 (P2&P1) 41-42 (P2 only), 43, 102-104 (subcom) and 241 (subcom).
4	AC Magnetic Field-Search Coils	6, 7, 16-21, 22-27
5	AC Electric Field-Narrow Band Filters	3, 35

Plotted Output:

Frame#	Type of Data	Spacecraft Channels
1	Channeltrons and Solid State Electron Detector	1, 48, 49, 50, 57-58 (channel 0 is used for the energy level indication).
2	Solid State Proton Detector-Part 1	52-55
3	Solid State Proton Detector-Part 2	4, 5, 51, 56
4	DC Electric and Magnetic Fields	8(P1 and P2), 11-14, 40-42 (P1&P2) (P2 points are connected by lines, P1 are not).
5	AC Magnetic Field-Search Coils	6, 7, 16-21, 24-27
6	AC Electric Field-Narrow Band Filters	3

TABLE 2

VERSION B: On Board Flight Programs 521A, B; 522B, C; 524A; 525A, B, C, D; 527A, B, C, D, E; 535A, B, C, D; 544A, B; 563A, B; 564A, B, C; 565A; 567A, B; 571A, B; 572A; 574A; 575A; 601B.

Tabular Output:

"Page"#	Type of Data	Spacecraft Channels
1	Channeltrons and DC Electric and Magnetic Fields	1-2, 8, 40-42, 43, 48-49, 241 (subcom)
2	Solid State Proton and Electron Detectors	0, 4, 5, 50, 51-56

Plotted Output:

Frame#	Type of Data	Spacecraft Channels
1	Channeltrons and Solid State Electron Detectors	1, 48, 49, 50 (channel 0 is used for the energy level indication).
2	Solid State Proton Detector-Part I	52-55
3	Solid State Proton Detector-Part 2	4, 5, 51, 56
4	DC Electric and Magnetic Fields	8, 40-42

TABLE 3

VERSION C: On Board Flight Programs 545A, B, C, D, E, F.

Tabular Output:

"Page"#	Type of Data	Spacecraft Channels
1	Solid State Proton Detector and DC Electric and Magnetic Fields	4, 8, 40-42, 51-56, 241 (subcom)

Plotted Output:

Frame#	Type of Data	Spacecraft Channels
1	Solid State Proton Detector-Part 1	52-55
2	Solid State Proton Detector-Part 2	4, 51, 56
3	DC Electric and Magnetic Fields	8, 40-42

TABLE 4

VERSION D: On Board Flight Programs 563A, B; 564A, B, C; 571A, B; 572A, B; 574A; 575A; 601B.

Tabular Output:

"Page"#	Type of Data	Spacecraft Channels
1	Buffer Memory Roll Counter, Channeltrons and Solid State Detectors, DC Magnetic Field (x-axis only)	0, 1, 4, 40, 48-49, 50, 51-56, 57-58, 71

Plotted Output:

Frame#	Type of Data	Spacecraft Channels
1	Channeltrons and Solid State Electron Detector	48-49, 50, 57-58 (Channel 0 is used for the energy level indication).
2	Solid State Proton Detector Part 1	52-55
3	Solid State Proton Detector Part 2	4, 51, 56
4	DC Magnetic Field	40

TABLE 5

VERSION R: On Board Flight Program 529A, B; 547A; 549A, B.

Tabular Output:

"Page"#	Type of Data	Spacecraft Channels
1	Channeltrons	1, 2, 48, 49, 57-58 (P1 and P2) 123-124 (subcom)
2	Solid State Proton and Electron Detectors	0, 4, 50, 51-56
3	DC Electric and Magnetic Fields and $\lvert\vec{B}\rvert$	8(P2 only), 11-14, 40-42 (P2 only), 43, 102-107 (subcom) and 241 (subcom)
4	AC Electric Field-Narrow Band Filters	3, 35
5	Rapid-sample Magnetic Fields (by rolls)	18-21, 24-27, 28-29, 40-42 (2 S/C bytes, P2 only)

Plotted Output:

Frame#	Type of Data	Spacecraft Channels
1	Channeltrons and Solid State Electron Detectors	1, 48-49, 50, 57-58 (channel 0 is used for the energy level indication)
2	Solid State Proton Detector Part 1	52-55
3	Solid State Proton Detector Part 2	4, 51, 56
4	DC Electric and Magnetic Fields	8, 11-14, 40-42 (3 S/C bytes)
5	AC Electric Field-Narrow Band Filters	3
6	Rapid-Sample Search Coil Fluxgate (by rolls)	28-29, 40-42 (2 S/C bytes)
7	AC Magnetic Field-Search Coils (by rolls)	18-21, 24-27

IV. Energy Density Program

The Energy Density Program computes particle flux, differential energy density and total energy density from the particle measurements contained on the S^3-A Experimenter Tape. The output modes are (a) tabular listings of particle flux as a function of energy and pitch angle, differential energy density in each energy and pitch angle interval and the integrated energy density, (b) plotted data on CalComp Plots, and (c) magnetic data tape containing the computed values. This tape is used for subsequent requests for data and is accessed through the Specialized Utility Programs (see section V).

Figures 8 to 11 are possible outputs from this program called POFEN (Proton Flux and Energy Density) to compute and display flux and energy density. The program collects data from each of the proton detector systems (Channeltrons, 0.7 to 30.0 keV; Solid State Proton Detector A-telescope, 24.3 to 300.0 keV; and Solid State Proton Detector - H-telescope, 390.0 to 872.0 keV). The Channeltrons step through the 8 energy levels (or 16 depending on ground command) sequentially. The energy change occurs midway between roll pulses. Data are collected for each energy level and are stored until the levels start recycling. At that point the various quantities are calculated. Figure 8 shows the calculations for 8 channeltron energy levels. In this example the spacecraft was synchronized to the sun (as indicated at the upper right of Figure 8) and so the roll pulse occurred at sun sight rather than when the x-axis magnetometer sensed a change from positive to negative magnetic field values (in which case 'MAG' would have been indicated). The data are separated into quadrants where quadrant 1 is defined to be the quadrant starting at the position of the solid state detectors when the roll pulse occurs (approximately 180^0 opposite the pulse sensors). For example, data for quadrant 4 are displayed in Figure 8 and show the calculations for the various energy levels vs. pitch angle (P.A.). When the spacecraft is synchronized to the sun, as it is in this example, the roll pulse may occur at a pitch angle other than 90°. This explains the value of 100.4° for the first pitch angle. If the spacecraft were synchronized to the magnetometer, the first pitch angle would be close to 90°. When measurements are made in quadrant 4, the pitch angle varies from minimum to maximum and thus 'opposite direction' is written at the top of the page. The diagram below illustrates this discussion.

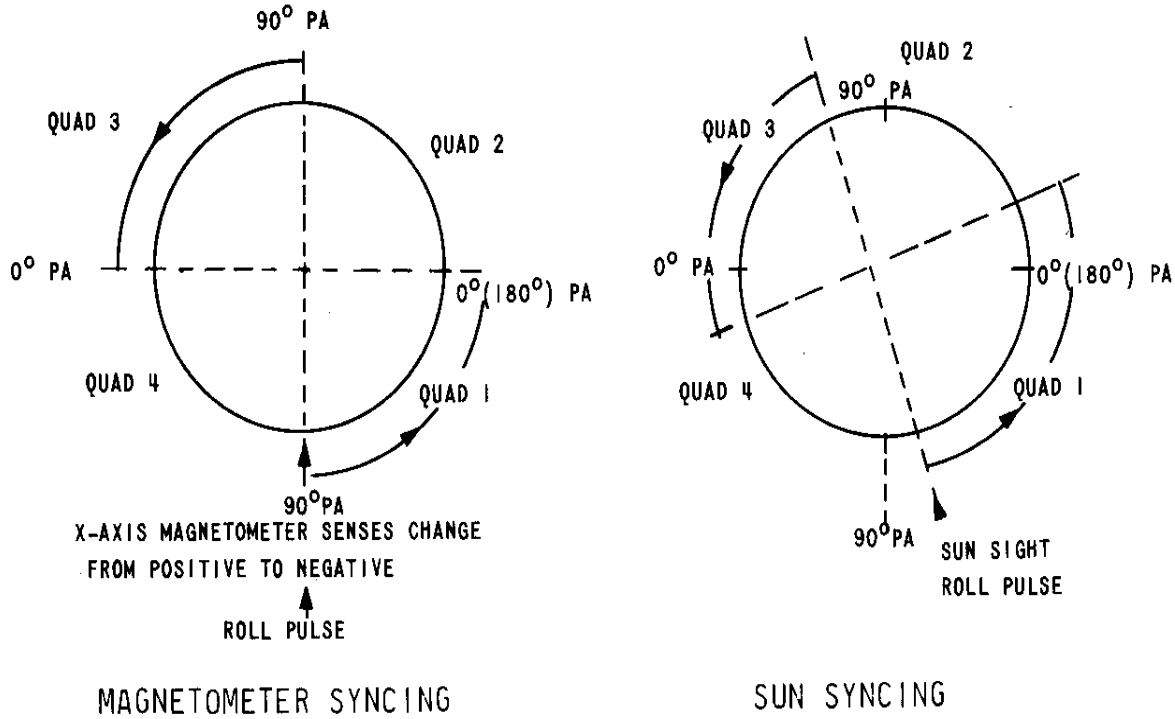

DIAGRAM I

Referring to Figure 8, the time indicated is that of the first point of the first energy level collected in this sequence. This is not necessarily the lowest level since the sequence may start at any level. In this example, 8 levels were collected, each level being measured for one roll, and the time of the printed data is within the interval starting at 15 hours, 51 minutes, 24 seconds and extending for the next 8 rolls. (Normally a roll is about 8.4 seconds but this may vary with orbit).

From the Solid State Proton Detectors, in each roll, either six energy levels are obtained from the A-telescope or four from the H-telescope (two low energy bands in the H-telescope are unused in this program). The particle data for each level is telemetered simultaneously so that in one roll all levels of one or the other telescope are obtained. The calculations for the A-telescope and the H-telescope are each printed separately in the same format as in Figure 8. However, because of the simultaneous sampling of the energy levels, the time indicated is the time of the first data point and extends only over one roll.

The upper half of Figure 8 displays flux and the lower half displays differential energy density. Row "i" shows the calculations for data collected from the "i<u>th</u>" pitch angle to the "i + 1<u>st</u>" pitch angle. Since in this case, 8 rolls were necessary to collect data for all 8 available levels, the pitch angle displayed is averaged over the 8 rolls of pitch angles calculated at the same position in the roll of the spacecraft.

The interval over which the data are accumulated is normally 1 sector (1/32 of a roll, or for most orbits about 0.262 seconds) during which the pitch angle varies by about 11°. However, the interval may vary depending on the On-Board Program and on the spin rate of the satellite. If the interval is less than one sector, this program sums the data until the interval is one sector. If the accumulation interval is greater than one sector, the program distributes the counts evenly for each sector. Thus, the program is fixed to a format of calculations once per sector.

The flux calculations are performed using the following relationship:

flux, $J = c/(dt*G*dE*e)$

which has units of particles/(sec*cm^2*ster*keV)

where:

c = counts/readout

dt = accumulation time (seconds/readout)

G = geometric factor (cm^2*ster)

dE = energy band of detector (keV)

e = efficiency of the detector (counts/particle)

Referring again to Figure 8, these values are printed in the table labeled 'FLUX' with simple sums for each energy level at the bottom of each column and sums for each pitch angle at the end of each row.

The double differential energy density with respect to energy and solid angle is printed in the table labeled 'ENERGY DENSITY'. These are calculated by

$$\frac{d^2\xi}{dEd\Omega} = J*E_0/V_0*s$$

which has units of ergs/(cm^3*ster*keV)

and

E_0 = center energy of the detector (keV/particles)

V_0 = velocity of the particles with energy E_0 (cm/sec)

s = $1.61 * 10^{-9}$ ergs/keV

The sums in the column headed 'SUM*E(I)' are approximate integrations over energy. Thus these are differential energy densities with respect to solid angle:

$$\frac{d\S}{d\Omega} = \int J*E_0/V_0*s \; dE \cong \sum_{i=1}^{n} J*E_0/V_0*s*DE(i)$$

and has units ergs/(cm^3*ster) where DE(i) is the energy interval over which this term is used in approximating the integral. (This DE is not necessarily the same as dE because the detector energy bands may overlap or not meet.) The number of energy intervals is n.

The sums in the lower row headed 'SUM*OGA(j)' are approximate integrations over solid angle, which are the differential energy densities with respect to energy:

$$\frac{d\S}{dE} = \int J*E_0/V_0*s \; d\Omega \cong \sum_{j=1}^{8} J*E_0/V_0*s*\Omega(j)$$

and have units ergs/(cm^3*keV). If $\alpha(j)$ is pitch angle j then $\alpha(j)$ is the solid angle from $\alpha(j)$ to $\alpha(j+1)$ so that $\Omega(j) = 2\pi\int_{\alpha(j+1)}^{\alpha(j)} \sin\alpha \, d\alpha$ (ster).

The last value in this row is the energy density over the entire range of the detector system. It is the approximate integration over energy and solid angle:

$$\S = \iint J*E_0/V_0*s \; d\Omega dE \cong \sum_{i=1}^{n} DE(i)*\sum_{j=1}^{8} J*E_0/V_0*s*\Omega(j) \quad (ergs/cm^3)$$

Each term of this sum over energy, namely

$$DE(i)*\sum_{j=1}^{8} J*E_0/V_0*s*\Omega(j)$$

is printed out in the next row headed 'SUM*OGA(J)*DE(I)'.

PN and PS are the normal and tangential components of energy density defined by

$$PN = \sum_{i=1}^{n}\sum_{j=1}^{8} \sin^2\alpha(j)*(J*E_0/V_0*s*\Omega(j)*DE(i))$$

$$PS = \sum_{i=1}^{n} \sum_{j=1}^{8} \cos^2\alpha(j)*(J*E_0/V_0*s*\Omega(j)*DE(i))$$

Then PN + PS is equal to the energy density.

The pitch angles are calculated as:

$\alpha = \cos^{-1}(Bx/(Bx^2 + By^2 + Bz^2)^{\frac{1}{2}})$

where Bx, By and Bz are the magnetometer readings converted to gammas (as described in the Summary Plots, Section II). The values then range from 0^0 to 180^0 but for the quadrants where α is normally greater than 90^0 the pitch angle printed is $180^0 - \alpha$. The magnetometer measurements are made less often than the particle measurements so a linear interpolation is performed between adjacent pitch angles unless a minimum or maximum occurs. In that case, a new extremum, α', is calculated as the point of intersection of the lines defined by the 2 points on either side of the old extremum. If the spin axis is not exactly perpendicular to the $\vec{B}$ field, particles are not measured at all pitch angles (see Diagram 2 below).

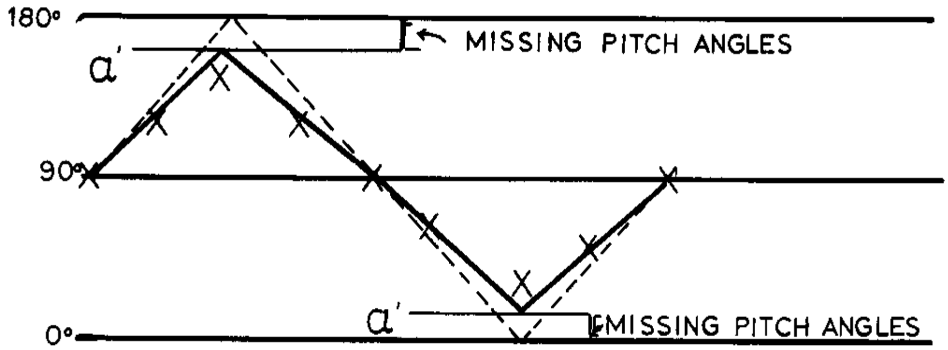

DIAGRAM 2

If α ' is within 20^0 of 0^0 or 180^0 pitch angle, the flux at these angles is quite small in comparison to that at larger pitch angles and the energy density is even smaller since the solid angle at these angles is small and thus is assumed to be negligible. However, if α' is not within 20^0 of 0^0 or 180^0 a correction should be made to the energy density. No correction is made by this program but α' (or 180^0-α') is printed. Written directly above that is the interval in which α' occurs. Referring to the example in Figure 8, the interval is '9' indicating α' occurred between the 9th pitch angle (15.3^0) and the 10th pitch angle (not indicated on the page).

The 'P.A. FLAG' in the upper right of Figures 8 and 9 indicates

1: - no problems calculating pitch angle

2: - saturation occurs in some magnetometer point necessary to calculated pitch angles.

3: - complete saturation of magnetometer.

In either case 2 or 3 the last valid pitch angle calculations are used.

Figure 9 shows the sum over the hemisphere defined by quandrants 3 and 4 of the energy density per keV for each energy band vs. time. The column of 'S' at the right indicates synchronization to the sun whereas a blank in this column indicates magnetometer synchronization. If the minimum pitch angle is greater than 20^0 it is printed along with the solid angle calculated in the interval in which this minmum occurred.

The data in figure 10 are derived from the Solid State Proton Dector A-telescope for orbit 321 in its entirety. This is a plot of energy density in each of the 6 energy bands measured by the A-telescope detector system in quandrants 3 and 4. The energy levels from lowest to highest are indicated by the symbols '1'-'6' as the points on the plot. Similar groups are produced for the Channeltrons and the Solid State Proton Detector H-telescope.

Figure 11 tabulates the sum of quadrants 3 and 4 of energy density over various energy bands and also the total energy density from 1 to 872 keV. The energy density calculated from the H-telescope detector is from 390.0 to 872.0 keV but the value shown is extrapolated from 300.0 to 390.0 keV by using the average of the energy density per keV of the highest (300.0 keV) band of the A-telescope and the lowest band (390.0keV) of the H-telescope.

Although the examples of Figures 8 to 11 illustrate only data from quadrants 3 and 4, the same analysis can be done for quadrants 1 and 2.

V. Specialized Utility Programs

Specialized programs described in this section are used to

a. examine certain data in greater detail during specific time periods.

b. facilitate interpretation

c. focus attention on particular aspects of the data

d. display the data in other formats as energy density spectra, flux spectra, three-dimensional flux and 1st invariant plots.

Figure 12 shows the energy density ($ergs/cm^3$) integrated over pitch angle in each of two selected energy bands of the channeltron detector system for all of orbit 314. Each quadrant or the sum of any of the quadrants can be plotted. The values are normalized to a hemisphere by multiplying the sums with weights as follows:

2.0 * sum of one quadrant	0.667 * sum of three quadrants
1.0 * sum of two quadrants	0.500 * sum of four quadrants

Figure 12 shows the energy density in energy band 6 (center energy of 2.7 keV) with a plot symbol '6' for each point, and energy band 16 (center energy of 25.6 keV) with a plot symbol 'x'. The points can optionally be connected and the levels are indicated by the point symbols where '2'-'8' indicate the respective levels and symbols 'A','C', 'E', 'X' indicate levels 10, 12, 14, 16 respectively. Similar plots for the Solid State Proton A-telescope use symbols '1'-'6' for the six energy levels and '9', 'A', 'B', 'C' for the four levels of the H-telescope in order of increasing energy levels.

Figures 13 and 14 show flux profiles for selected energy bands and a selected pitch angle interval. The flux values plotted are those calculated by the Energy Density Program (section IV). Figure 13 shows the entire orbit while Figure 14 shows an expanded time scale of a portion of the orbit. The flux measured in a particular quadrant or the average flux measured in more than one quadrant may be plotted.

The differential proton energy density spectrum, $d\xi/dE$ vs. E, is plotted in Figure 15. The values plotted are those obtained by the Energy Density Program.

The bars indicate the sum of $d\xi/dE$ calculated in quadrants 3 and 4 for each energy band. The width of the bars show the energy band measured by the particular detector. The sum of $d\xi/dE$ calculated in quadrants 1 and 2 is indicated by '+' and extend over the same energy intervals indicated by the bars. The time shown is the beginning of the time interval over which the data on the graph were collected.

The proton flux spectrum, J vs. E, for a particular pitch angle range is shown in Figure 16. The average flux calculated at this pitch-angle-range in quadrants 3 and 4 and the average flux in quadrants 1 and 2 for each energy band are plotted as described in the previous paragraph.

Figure 17 is a 3-demensional plot of energy vs. pitch angle vs. proton flux with the projection onto the x-y plane. This is an example of flux measured while pitch angle varied from maximum to minumum, 179.0^{0} to 1.0^{0} in this case. The plot contains flux from the energy levels measured by the Channeltron, Solid State Proton A-telescope, and Solid State Proton H-telescope detector system. The fluxes and pitch angles are calculated in program POFEN. There is an option to also plot data collected from minimum to maximum pitch angle. As explained in the discussion of POFEN and by Diagram 1, section IV, the pitch angle progresses, starting from quadrant 1 (one), as 90^{0} to 180^{0} to 90^{0} to 0^{0} to 90^{0}. Thus data displayed from minimum to maximum pitch angle is measured in quadrants 4 and 1 while data from maximum to minimum is measured in quadrants 2 and 3.

The time indicated in Figure 17 is the beginning time of the interval over which the data were collected.

A plot of a number, J/E, which is proportional to the density in phase space for 90^{0} particles, is plotted as a function of the first invariant, E/B, in Figure 18. The flux closest to 90^{0} pitch angle is averaged over the requested quadrants for each energy band and then divided by the center energy of the detector, E_{0}, in keV. The bars extend from EMIN/B to EMAX/B where EMIN and EMAX define the limits of the energy range of each detector. The $\vec{B}$ field is calculated as for the Summary Plots (Section 1) and its value in gammas is printed at the upper right. Thus units for the abscissa are keV/gamma. The pitch angle printed is the average of the pitch angles of the data shown in the plot. The time is the midpoint of the interval over which the data on the graph were collected.

VI. Energy Level Plot Program

The Energy Level Plot Program was developed, initially, to analyze the particle data from the second half of S^3-A observations when the analog data from the satellite were not available, due to a failure in an analog multiplexer on the spacecraft in April of 1973.

However, almost all the functions provided by this program, with the exceptions mentioned later in this section, are equally well available for the observations during the earlier half of S^3-A. This program performs detailed data analysis to separate telemetry data corresponding to the various energy levels, roll by roll, and optionally calculates the pitch angle associated with each observation. The resultant output is available as 30" CalComp plots and/or SD-4060 microfilm plots with several options which will be described later. Briefly, the various types of basic plots available are:

(a) The plots of the proton counts/sector as a function of time (plotted along horizontal axis) for each energy band. Separate plots exist for each energy level (8 or 16 channeltron levels and 6 low-energy SSPD levels) and all the counts for a particular cycle are plotted in a vertical line corresponding to the time at the end of the energy step (see Figure 19). Similar plots for the electrons (16 or 8 channeltron levels and 4 SSED levels) are also available in a separate computer run;

(b) Plots similar to (a) above except that instead of all the points in an energy level cycle, only a maximum of four points corresponding to the observations at approximately 90^0, 70^0, 50^0 and 30^0 pitch angles are displayed with an identifying plot symbol (see Figure 20);

(c) Approximately two minute averages of the proton or electron flux spectrum (flux vs. energy) for any or all four pitch angles mentioned in the above (see Figure 21); and,

(d) The double differential energy density spectrum plots similar to (c) above (see Figure 22).

Since plots (c) and (d) are available as subsets of various outputs from the Energy Density Program, they have usefulness only for the S^3-A orbits where analog data are not available. For the sake of completeness, listed in Appendix B are the energy bands in keV corresponding to the various proton and electron energy levels used in this Program.

This program is capable of processing data from essentially all the On-Board Flight Programs. Clearly, the On-Board Program present would dictate whether a certain type of data are actually available or not (except, when a particular detector has been shut-off by ground control commands to conserve power); for example, no Solid State Proton or Electron data are available when the On-Board Program 549B is present. For this purpose, the Table 6 below lists the addressable channels processed by the commonly used flight programs.

Table 6

Particle Detector Sampling in Some Commonly Used Flight Programs

On-Board Flight Program	Electron Chann.	SSED	Proton Chann.	SSPD	SYNC
521A	Y	Y	Y	Y	D
522A, B	Y	Y	Y	Y	S/C
524A	N	N	Y	Y	D
525B, D	Y	Y	Y	Y	D
527E	Y	Y	Y	Y	D
545E	N	N	N	Y	D
547A	Y	Y	Y	Y	D
549B	Y	N	Y	N	D
563A	Y	Y	Y	Y	D
564A	Y	Y	Y	Y	D
572A	N	N	N	Y	D
601B	Y	Y	Y	Y	D

Y = Yes, N = No, D = Data Sync Clock, S/C = Spacecraft Sync Clock

Figure 19 shows the output plots for the Solid State Proton detector data for a period of approximately one-half of an S^3-A orbit. Only the low SSPD energy levels are plotted. Generally, the Solid State Proton detector data are collected in a low energy mode for three spacecraft rolls and then in high energy mode for one roll. This program, after analysis of data, picks up a roll corresponding to the low energy mode and then plots data for every fourth roll there-after. Since the sampling rate of any Solid State Proton detector data depends on the On-Board Flight Program used on the spacecraft at that instant and may also vary from one roll to another roll (in a systematic manner), all the counts, before plotting, have been normalized to counts per sector. For instance, for On-Board Flight Program 564A, SSPD2 is sampled once per sector in rolls 1 to 4 and twice per sector in rolls 5 to 8. The counts, therefore, in rolls 5 to 8 are multiplied by a factor of two. The number of points plotted in a vertical line is a function of the sampling rate (or, equivalently of the Flight Program). However, an option exists within the program to request all the points be plotted or points in quadrants 3 and 4 only (see Diagram 1, under Energy Density Program, for explanation) be plotted. The time on the horizontal axis would always correspond to the end of the energy level.

Plots similar to the ones in Figure 19 are also obtained for the proton channeltrons. There are eight plots in a frame; thus, one or two frames will be plotted depending on whether the energy range is covered in 8 or 16 steps. In an 8 step sequence, the energy levels are cycled through levels 16, 14, 12, 10, 8, 6, 4, and 2 with increasing time, while in a 16 step sequence the cycle is 16, 15, ..., 3, 2, 1. In a particular frame, the sequence of levels processed moves upwards. Thus, for a 16 step sequence, the first frame will have channeltron level 16 at the bottom and the channeltron level 9 at the top; the second frame will have channeltron level 8 at the bottom and level 1 at the top. However, this situation occurs only for the orbits in the first half of the life of the S^3-A observations, only where the absolute level number can be determined. For the later orbits, characters A, B, C, ..., N, O, P would be written for the channeltron level numbers. Usually, a study of the output plots helps one to determine the actual level numbers. One of the important facts to key on is to determine in which two adjacent plots the change from level 1 (or level 2, for 8 step sequence) to level 16 has occurred. Thus, if level C is determined to be actually level 1 and level D to be level 16, the remaining levels are uniquely identified. Just as in the case of SSPD, an option exists whether all the points for an energy level be plotted or only the points corresponding to quadrants 3 and 4 be plotted. However, when the channeltron detectors change levels after every half-roll, the request for 'quadrants 3 and 4 only' would be suppressed.

For electrons, in addition to the electron channeltron plots similar to the proton channeltron plots, plots similar to those in Figure 19 are also obtained for the Solid State Electron Detector (SSED). In this case, one plotted frame has the four plots corresponding to the four SSED levels. The bottom-most plot corresponds to the lowest energy level (ie. level 1). As remarked earlier, for the orbits during the second half of the life of S^3-A, the actual SSED levels cannot be determined, and so, the letters A, B, C, and D are written for the SSED energy levels. Visual study of the output plots can, again, help one to determine the actual energy level.

Figure 20 shows the output plots similar in nature to the plots in Figure 19 except that, now, the counts corresponding to the (approximate) values of pitch angles of 90°, 70°, 50°, and 30° have been separated and identified by the following characters:

Character	Value of pitch angle
-	90^0
.	70^0
*	50^0
+	30^0

Since the sampling rate for any detector is a characteristic of the On-Board Flight Program present on the spacecraft, it may not always be possible to have a count near each of the above values. For most cases, when the sampling rate is at least once per sector, the difference in pitch angles between two consecutively readout counts will be less than 360/32 ie. less than 11^0. A count is identified to correspond to, say, 70^0 if, i) the pitch angle calculated at the instant this count was readout is the one nearest to 70^0 and, ii) it is no more than 9^0 away from 70^0.

The calculation of pitch angle is best performed in the Geocentric Equatorial Inertial (G.E.I.) Coordinate System (Russell, CE, 1971). For this, we use the POGO (8/69), Epoch 1969.0 (Cain and Sweeney, JGR, 1970) magnetic field model, the components of which in the G.E.I. coordinate system are available from the S^3-A definitive orbit/attitude tape. Also available on this tape are, the sun vector and spacecraft Z-axis components in the G.E.I. coordinate system. The pitch angle is calculated as follows:

Let $\hat{Z}$, $\hat{B}$, and $\hat{S}$ by the unit vectors, respectively, along spacecraft Z-axis, B-field and the sun line and let $\hat{X}$, $\hat{Y}$ be the other two unit vectors along spacecraft coordinate axis. Thus, $\hat{X}$ and $\hat{Y}$, for a roll spin, are rotating about the spin axis ($\hat{Z}$ vector) and, thus, their values are changing in the G.E.I. coordinate system. Let at time $t = t_0$, $\hat{X}$ and $\hat{Y}$ have the values $\hat{X}_0$ and $\hat{Y}_0$. Then, the unit vector, $\hat{d}$, pointing towards the Solid State Proton Detector (which remains fixed along the spacecraft x-axis) at time t will be

$$\hat{d} = \cos\omega\,\hat{X}_0 + \sin\omega\,\hat{Y}_0$$

$$\omega = \frac{2\pi\,(t-to)}{T} \qquad , \ T = \text{roll period}$$

Thus, the pitch angle α at this instant, is determined by

$$\cos\ \alpha = \hat{B}.\hat{d} = \cos\omega\,\hat{B}.\hat{X}_0 + \sin\omega\,\hat{B}.\hat{Y}_0$$

The choice of vectors $\hat{X}_0$ and $\hat{Y}_0$, where t_0 corresponds to the 'roll start time' makes the calculation the simplest. We thus have two cases:

Case 1: Sun Sync. In this case, the roll pulse corresponds to the sun sight. Since sun-sensor lies along the spacecraft x-axis, in this case, $\hat{S}$ lies in the $\hat{X}_0\ \hat{Z}$ plane and so

$$\hat{Y}_0 = \frac{\hat{Z} \times \hat{S}}{|\hat{Z} \times \hat{S}|}$$

and $$\hat{X}_0 = \hat{Y}_0 \times \hat{Z}.$$

The pitch angle is now easily calculable.

Case 2: Magnetometer Sync. In this case, the roll pulse corresponds to the instant of the x-axis magnetometer changing sign. If Θ is the angle between $\hat{Z}$ and $\hat{B}$, then

$$\hat{B} = \cos\Theta\,\hat{Z} + \sin\Theta\,\hat{Y}_0$$

i.e. $$\cos\Theta = \hat{B}.\hat{Z}.$$

Thus,

$$\cos\alpha = \hat{B}.\hat{d} = \sin\Theta\,\sin\omega \qquad \text{gives the pitch angle.}$$

Plots similar to figure 20 are obtained for the proton channeltrons, electron channeltrons and the solid state electron detector with the ordering of plots, etc., being still the same as described for figure 19.

Some restrictions or additional options available on the preceding plots are now mentioned. Plots similar to Figure 20 are not available for the orbits utilizing On-Board Flight Programs in the spacecraft clock sync mode. This is because the algorithm for computing the pitch angles from the model magnetic field values cannot be used in this mode. This situation does not occur in any orbit during the second half of the S^3-A life time. However, it does remain a restriction for the orbits in the first half of S^3-A life time. Since for an S^3-A orbit several hundreds of thousand points are plotted in the type of plot of Figure 19, the CalComp plots requires several hours of plotter time. Thus, it may, in general, be a better idea to get SD-4060 plots for the entire orbit to get an asymptotic idea of the physics and then to get CalComp plots for the selected interval(s) of the orbit. When SD-4060 microfilm plots are desired, the requested time is divided into intervals of two hours to be plotted on separate frames. This insures proper resolution since the horizontal width on a SD-4060 frame is limited. For any plot similar to Figures 19 and 20 an available option is the range along y-axis. This can be specified by the two parameters, m and n, defined as

$$Y_{min} = 10^{n} \qquad n = 0, 1, \ldots.$$

$$Y_{max} = 10^{(m+n)} \qquad m = 1, 2, \ldots.$$

Finally, one could, optionally, have all the x-axes (on the various plots in a single frame) be labeled in contrast to the default situation of the bottom-most plot being labeled as in Figures 19 and 20.

Figures 21 and 22, respectively, give the particle flux in units of number/cm^2-sec-ster-keV and the differential energy density in units of ergs/cm^3-ster-keV. The calculations of these quantities is similar to the calculation outlined in the Energy Density Program (section IV). The output plots are similar to the corresponding plots in that program except for the following comments:

(i) One can make separate or a single plot corresponding to any set of the four values of pitch angles specified earlier (i.e. $\sim 90^{\circ}$, 70°, 50°, and 30°). The calculation of the pitch angle remains the same as previously outlined. Thus, one could specify, for example, fluxes and differential energy densities corresponding to particles with pitch angles approximately 30° and 90°, and only these would be plotted (on the same plots or separate plots). The character plotted at the center of the energy bar determines the pitch angle value used; the legend for this remains the same as given earlier.

(ii) The choice of the CalComp and/or the SD-4060 microfilm plots exists.

(iii) L-value and the Magnetic Local Time printed on each plot are read from the definitive orbit/attitude tape and correspond to the minute just before the time printed on each plot.

(iv) Approximately, two minute average values are plotted. Actually, 16 rolls of the spacecraft are used and since the roll period is roughly 8.4 seconds, it amounts to over two minutes. For the cases where channeltrons have 16 step sequence and level changes after a full roll, this corresponds to a single point. However, for the case of an 8 step sequence and half roll long energy level steps, the values used correspond to the averages of four readouts. For the Solid State detectors, one always has average of at least two points.

VII. Bibliography:

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APPENDIX A

S^3-A ADDRESSABLE CHANNELS

EXPERIMENT	ABREV	CHANNEL #	CHANNEL ASSIGNMENT	TYPE ANALOG	TYPE MSB
SSED	CMST	0	Commutator and Gain Status	"	"
CHM	SCL	1	Staircase Level	"	"
CHM	CHST	2	Channeltron Status	"	"
ACEF	SAO	3	Spectrum Analyzer Output	"	"
SSPD	SSPA1	4	SSPD - Analog Word 1	"	"
SSPD	SSPA2	5	SSPD - Analog Word 2	"	"
ACMF	S1B7	6	Search Coil X-Axis, Band 7	"	"
ACMF	S2B7	7	Search Coil Z-Axis, Band 7	"	"
DCEF	E5	8	X5 DC Electric Field (X20, actual)	"	"
DCEF	E50	9	X50 DC Electric Field (X200, actual)	"	"
DCEF	E100	10	X100 DC Electric Field	"	"
DCEF	BP31	11	.3-1 Hz Bandpass Filter	"	"
DCEF	B13	12	1-3 Hz Bandpass Filter	"	"
DCEF	B310	13	3-10 Hz Bandpass Filter	"	"
DCEF	B1030	14	10-30 Hz Bandpass Filter	"	"
		15	Note Available, Not Used	"	"
ACMF	S1B1	16	Search Coil X-Axis, Band 1	"	"
ACMF	S1B2	17	Search Coil X-Axis, Band 2	"	"
"	S1B3	18	" " " Band 3	"	"
"	S1B4	19	" " " Band 4	"	"
"	S1B5	20	" " " Band 5	"	"
"	S1B6	21	" " " Band 6	"	"
"	S2B1	22	Search Coil Z-Axis, Band 1	"	"
"	S2B2	23	" " " Band 2	"	"
"	S2B3	24	" " " Band 3	"	"
"	S2B4	25	" " " Band 4	"	"

S^3-A ADDRESSABLE CHANNELS

EXPERIMENT	ABREV	CHANNEL #	CHANNEL ASSIGNMENT	TYPE ANALOG	MSB
"	S2B5	26	" " " Band 5	"	"
"	S2B6	27	" " " Band 6	"	"
"	SCMX	28	Search Coil Rapid Sample, X-Axis	"	"
"	SCMZ	29	" " " " Z-Axis	"	"
ACEF	ACEFR	30	AC E-Field Rapid Sample	"	"
	TTO	31	Test Turn On, Ground Checkout Only	"	"
	SCTM	32	SCC Time (16 Bits)(Spacecraft Clock)	PARALLEL	DIGITAL
	SCTC	33	SCC Time (12 Bits) Course	"	"
ACEF	SCTF	34	SCC Time (12 Bits) Fine	PARALLEL	DIGITAL
ACEF	ICTR	35	AC E Counter	"	"
"	COND	36	Condition Bits (6 Bits) 0,0,6,5,4,3,2,1	"	"
		37	Non Existent	"	"
		38	Non Existent	"	"
		39	Non Existent	"	"
DCMF	FGX	40	X-Axis Fluxgate Magnetometer	ANALOG	LSB
DCMF	FGZ	41	Z-Axis Fluxgate Magnetometer	"	"
DCMF	FGY	42	Y-Axis Fluxgate Magnetometer	"	"
DCMF	P12M	43	F.C. +12 Volt Monitor	"	"
		44	A Spare	"	"
		45	Not Available, Not Used	"	"
		46	Not Available, Not Used	"	"
		47	Not Available, Not Used	"	"
CHM	ABE	48	Channeltron A/B Data Out - Electrons Acc#1	RANDOM	PULSE
CHN	CDP	49	Channeltron C/D Data Out - Protons Acc#2	"	"
SSED	SSDE	50	Solid State Electron Detector Acc#3	"	"

S^3-A ADDRESSABLE CHANNELS

EXPERIMENT	ABREV	CHANNEL #	CHANNEL ASSIGNMENT	TYPE RANDOM	TYPE PULSE
SSPD	SSPD6	51	SSPD - Digital Word 6 Acc#4	"	"
SSPD	SSPD1	52	SSPD - Digital Word 1 Acc#5	"	"
"	SSPD2	53	" " Word 2 Acc#6	"	"
"	SSPD3	54	" " Word 3 Acc#7	"	"
"	SSPD4	55	" " Word 4 Acc#8	"	"
"	SSPD5	56	" " Word 5 Acc#9	"	"
CHM	EDAT	57	Channeltron, Z-Axis E Data Out Acc#10	"	"
CHM	FDAT	58	Channeltron, Z-Axis F Data Out Acc#11	"	"
		59	Non Existent	"	"
		60	Non Existent	Serial	Digital
	STARD	61	Star Data (SCADS)	"	"
	SUND	62	Sun Data (Optical-Aspect)	"	"
		63			

APPENDIX B

S^3-A Energy and Frequency Bands

Proton and Electron Channeltron Energy Bands:

Channeltron Level	Energy E_0 (keV)	E_{min} (keV)	E_{max} (keV)	ΔE (keV)	Addressable Channel
1	0.84	0.71	0.97	0.26	48 for electrons
2	1.16	1.01	1.37	0.36	49 for protons
3	1.43	1.21	1.65	0.44	
4	1.76	1.53	2.08	0.55	
5	2.25	1.90	2.60	0.70	
6	2.69	2.34	3.18	0.84	
7	3.33	2.81	3.84	1.03	
8	4.04	3.51	4.77	1.25	
9	4.94	4.17	5.70	1.53	
10	6.04	5.25	7.13	1.87	
11	7.56	6.39	8.73	2.34	
12	9.16	7.97	10.81	2.84	
13	11.34	9.58	13.10	3.52	
14	13.50	11.74	15.93	4.19	
15	17.76	15.50	21.01	5.51	
16	25.62	22.29	30.23	7.94	

Solid State Proton Detector (SSPD) Energy Bands:

Low Energy Mode: A-Telescope

SSPD Level	Energy E_0 (keV)	E_{min} (keV)	E_{max} (keV)	ΔE (keV)	Addressable Channel
1	29.7	24.3	35.1	10.8	52
2	42.75	35.1	50.4	15.3	53
3	64.5	50.4	78.6	28.2	54
4	108.55	78.6	138.5	59.9	55

S^3-A Energy and Frequency Bands

Channeltron Level	Energy E_0 (keV)	E_{min} (keV)	E_{max} (keV)	ΔE (keV)	Addressable Channel
5	167.0	138.5	195.5	57.0	56
6	247.75	195.5	300.0	104.5	51
High Energy Mode: H-Telescope					
9	410.0	390.0	430.0	40.0	54
10	481.5	430.0	533.0	103.0	55
11	603.5	533.0	674.0	141.0	56
12	773.0	674.0	872.0	198.0	51

Solid State Electron Detectors (SSED) Energy Bands:

SSED Level	Energy E_0 (keV)	E_{min} (keV)	E_{max} (keV)	ΔE (keV)	Addressable Channel
1	55.0	35.0	75.0	38.0	50
2	105.0	75.0	126.0	49.0	
3	188.0	126.0	230.0	104.0	
4	325.0	280.0	405.0	125.0	

The energy E_0 is the center energy for the channeltrons (so that $E_{min} = 0.87E_0$ and $E_{max} = 1.18E_0$) and is the center of E_{min} and E_{max} for Solid State Detectors.

AC E-Field Frequency Bands:

Filter Number	Minimum Frequency (kHz)	Maximum Frequency (kHz)	Addressable Channel
F_0 (Wide Band)	0.15	10.00	3
F_1	75.00	115.00	
F_2	41.80	75.00	
F_3	23.50	41.80	
F_4	13.30	23.50	

Filter Number	Minimum Frequency (kHz)	Maximum Frequency kHz)	Addressable Channel
F_5	7.50	13.0	3
F_6	4.18	7.50	
F_7	2.35	4.18	
F_8	1.33	2.35	
F_9	0.75	1.33	
F_{10}	0.418	0.750	
F_{11}	0.247	0.418	
F_{12}	0.149	0.247	
F_{13}	0.084	0.149	
F_{14}	0.048	0.084	
F_{15}	0.030	0.048	

DC E-Field Frequency Bands:

Minimum Frequency (kHz)	Maximum Frequency (kHz)	Addressable Channel
0.010	0.030	14
0.003	0.010	13
0.001	0.003	12

Search Coil Magnetometer Frequency Bands:

Minimum Frequency (Hz)	Maximum Frequency (Hz)	------ Addressable Channel ------	
		X-axis	Z-axis
1000.00	3000.00	6	7
300.00	1000.00	21	27
100.00	300.00	20	26
30.00	100.00	19	25
10.00	30.0	18	24
3.0	10.0	17	23
1.0	3.0	16	22

VIII. Appendix C

Spacecraft Coordinate System:

A photograph of the Explorer 45 satellite showing the configuration of the detectors mounted on the booms and in the main body appears in Figure 23. The spacecraft consists of a main body and five booms. The midband of the spacecraft contains the electronic systems and the particle detectors. For the purpose of the identification of the location of the various instruments, we shall define a left-handed coordinate system as follows:

The spin axis which is the axis of symmetry shall define the z-axis. The direction of the small booms and large booms shall define the x-axis and y-axis, respectively. All of the detectors except two are placed perpendicular to the spin axis, so that, they observe in the x-y plane. Figure 24 shows a view of the spacecraft looking down the z-axis. The direction of the spacecraft spin is from + y-axis to + x-axis. Notice that we use a left-handed coordinate system for this description. For most calculations when one chooses a right-handed coordinate system, the direction of the spin is from + x-axis to + y-axis.

Looking at the spacecraft drawing again (Figure 23), a triaxial fluxgate magnetometer is contained in the rectangular box on the boom along the spin axis. The polarity directions for the x and y axes magnetometers are as shown in Figure 24 and the z-axis magnetometer has polarity along - z-axis. Two search coil magnetometers, one parallel and one perpendicular to the spin axis, are held at the end of the short booms. The two spheres, mounted 5 meters apart on the long, insulated booms, serve as sensors for both dc and ac electric field measurements. While the electric field measurements are made only along one axis, two-axis information is obtained because of the satellite spin.

At an angle of $22\frac{1}{2}^0$ to the x-axis, i.e. along facet 'F', lies the channel multiplier detector system. For the following description, it is more convenient to define another set of orthogonal x' and y' axis which are coplaner to x-y plane. The x' axis makes an angle of $22\frac{1}{2}^0$ with the x-axis. Thus, the x-y axis channeltrons make observations along x' axis. Thus, with the spin of the spacecraft, various pitch angles will be scanned. Since the z-axis was placed near the ecliptic plane, the local magnetic field stays near the x-y (or equivalently, x'-y') plane and so pitch angle range from 90^0 down to a small angle are measured. Also, along the facet 'F', looking perpendicular to the x-y plane lie the two z-axis channeltrons, which thus measure particles of relatively fixed (and near 90^0) pitch angle particles.

The two other important instruments along facet 'F' and looking along x' axis are the OA Earth telescope and the sun sensor. The latter instrument would determine the times of sun crossings. In the data sync clock mode, while synchronized to the sun sensor, the sun crossing would initialise the 'roll start pulse' and, thus, would correspond to sector zero. However, while synchronized to the magnetometer, the 'roll start pulse' is initialised when the x-axis fluxgate magnetometer becomes negative. (Actually, the polarity vectors of x-axis and y-axis fluxgate magnetometers lie along + x' axis and - y' axis as shown in the Figure 24). Thus, in this case at sector zero, the magnetic field would be perpendicular to the x' axis and its component in the x-y plane will be the vector $\vec{Bxy}$, i.e. $\vec{B}$ field at roll start time will be along y' axis.

Along the facet B and looking in the - x' axis direction is the Solid State Electron Detector system (containing a magnetic spectrometer with four surface barrier detectors) and the Solid State Proton Detector system (consisting of two surface barrier Solid-State Detector telescopes, each with two elements). As in the case of the channeltrons, with the spin of the spacecraft, virtually a complete equatorial pitch angle distribution of the particles can be obtained during each roll.

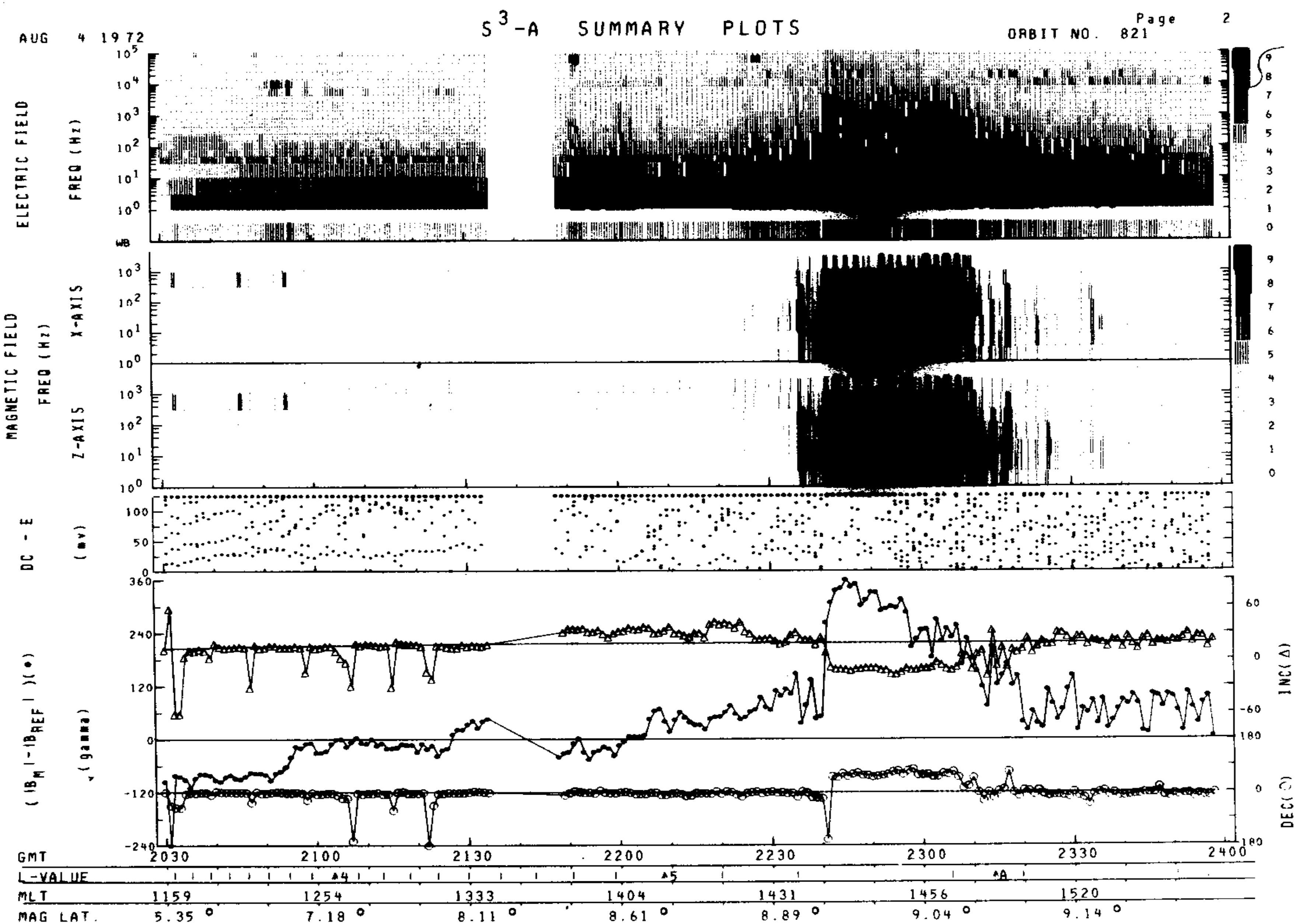
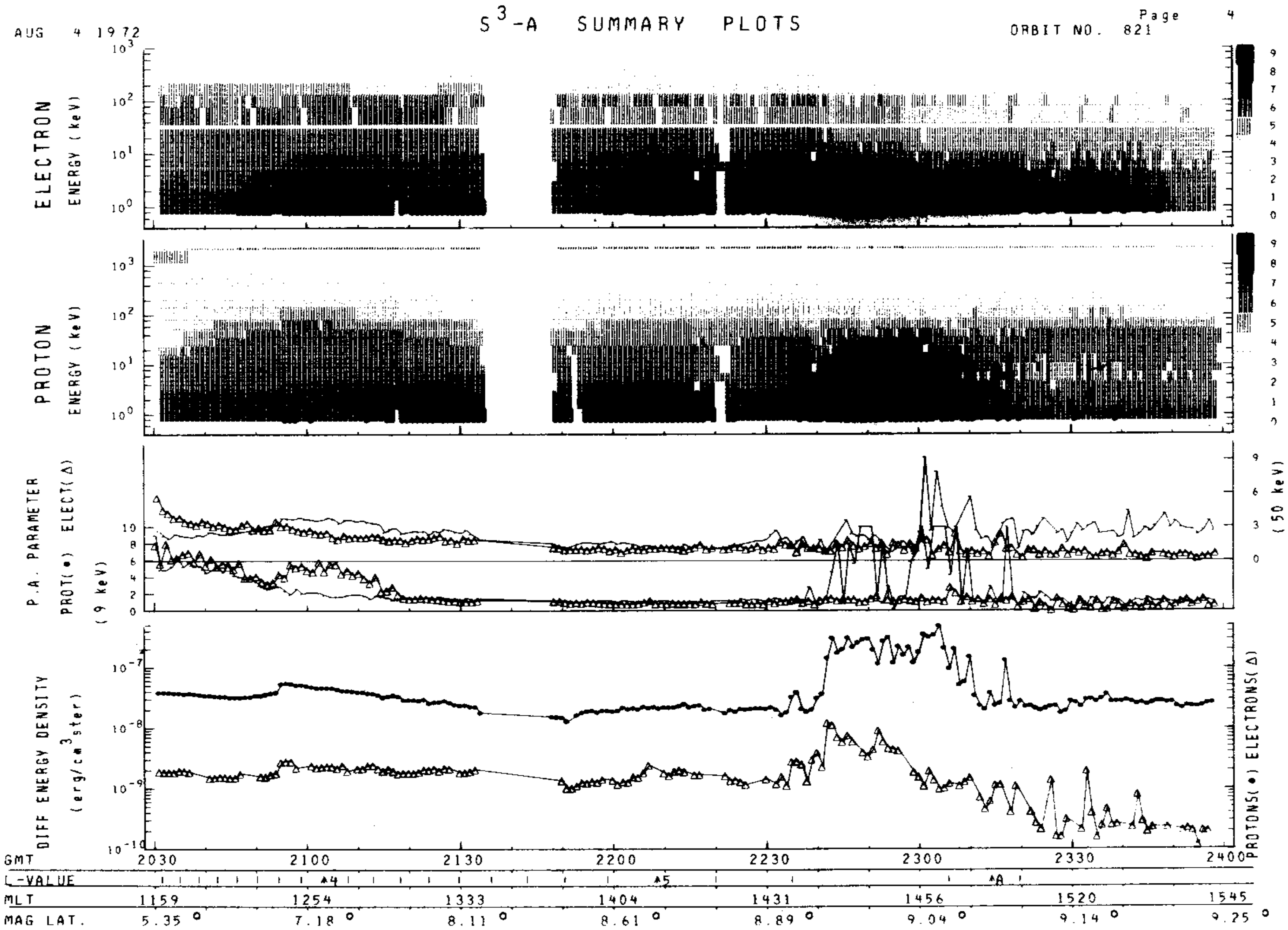

AUG 4 1972
S3-A SUMMARY PLOTS
ORBIT NO. 821
Page 2
ELECTRIC FIELD
FREQ (Hz)
MAGNETIC FIELD
FREQ (Hz)
X-AXIS
Z-AXIS
DC - E
(mv)
(|B_M|-|B_REF|)(•)
(gamma)
INC(Δ)
DEC(○)
GMT
L-VALUE
MLT
MAG LAT.
2030 2100 2130 2200 2230 2300 2330 2400
1159 1254 1333 1404 1431 1456 1520
5.35° 7.18° 8.11° 8.61° 8.89° 9.04° 9.14°

Figure 1



AUG 4 1972
S3-A SUMMARY PLOTS
ORBIT NO. 821
Page 4
ELECTRON
ENERGY (keV)
PROTON
ENERGY (keV)
P.A. PARAMETER
PROT(•) ELECT(Δ)
(9 keV)
(50 keV)
DIFF ENERGY DENSITY
(erg/cm3 ster)
PROTONS(•) ELECTRONS(Δ)
GMT 2030 2100 2130 2200 2230 2300 2330 2400
L-VALUE 4 5 6
MLT 1159 1254 1333 1404 1431 1456 1520 1545
MAG LAT. 5.35° 7.18° 8.11° 8.61° 8.89° 9.04° 9.14° 9.25°

Figure 2

NASA - GSFC   53-A QUICK LOOK   FLIGHT PROGRAM NO : 525A   DATA SYNC CLOCK   ORBIT NO : 315

TIME FROM 72:055 16:30:00 TO 72:055 16:33:00   (24 FEB 1972)   ROLL PERIOD (SEC) : 8.401   CHANNELTRONS & DC FIELDS

==

AT 16 HR 30 MN 0 SEC   PREDICTED L = 3.299   MLT = 15:56   ALT = 13983.0 KM   HALF MIN NO : 1

CH241 = 00000001 (ASSUMED)

P2 TIME (SEC	SEC TOR	STAIRCASE LEVEL	X-Y GEOM	P2 X-Y PROTONS	P2 X-Y ELECTRONS	MAG OF B (GAMMAS)	+12V	X-AXIS	Y-AXIS	Z-AXIS	DC* 5
00.109	6	8/ / /	LL	27	38						2.80
00.371	7			16	11						
00.634	8	0.67	0.08	8	13	69.1		1.926	2.527	2.571	2.63
00.896	9			11	17						
01.158	10			15	26						2.53
01.420	11			21	36						
01.683	12			34	50	70.2		2.097	2.923	2.566	2.39
01.945	13			36	84						
02.207	14			44	116						2.22
02.469	15			80	160						
02.732	16			76	200	72.0		2.512	3.099	2.566	2.00
02.994	17	/ / 6/	LL	88	120						
03.256	18			58	116						4.84
03.518	19			52	80						
03.781	20			46	48	71.4		2.918	2.923	2.566	1.80
04.043	21			26	40						
04.305	22			20	30						1.90
04.567	23			12	13						
04.830	24	0.39	0.08	10	13	69.6		3.079	2.507	2.566	2.08
05.092	25			12	10						
05.354	26			23	24						2.29
05.616	27			30	48						
05.879	28			36	58	69.9		2.918	2.097	2.586	2.55
06.141	29			32	76						
06.403	30			80	128						2.82
06.665	31			92	112						
06.928	0			92	128	69.1		2.507	1.926	2.586	3.06
07.190	1	/ / 6/	LL	112	144						
07.452	2			128	144						0.33
07.714	3			92	128						
07.977	4			68	84	68.6		2.097	2.097	2.586	3.00
08.239	5			52	76						
08.501	6			28	38						2.82
08.763	7			17	12						
09.026	8	0.39	0.08	7	13	69.1		1.926	2.527	2.571	2.65
09.288	9			6	10						
09.550	10			16	29						2.53
09.812	11			30	34						
10.075	12			38	50	69.4		2.107	2.923	2.566	2.39
10.337	13			48	76						
10.599	14			54	104						2.22
10.861	15			76	124						
11.124	16			80	136	71.4		2.512	3.094	2.566	1.98
11.386	17	4/ / /	LL	76	120						
11.648	18			62	84						4.86
11.910	19			48	62						

Figure 3

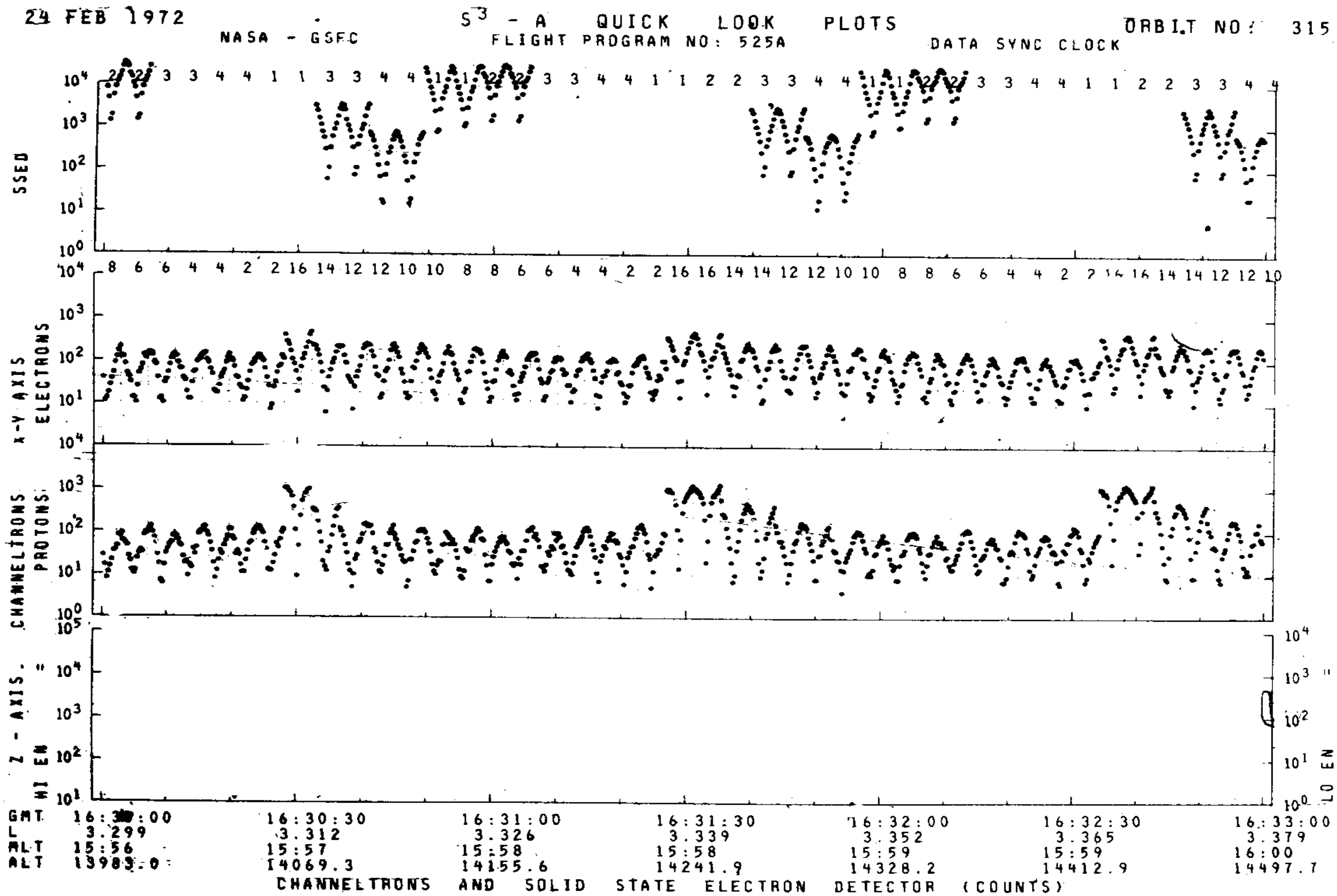
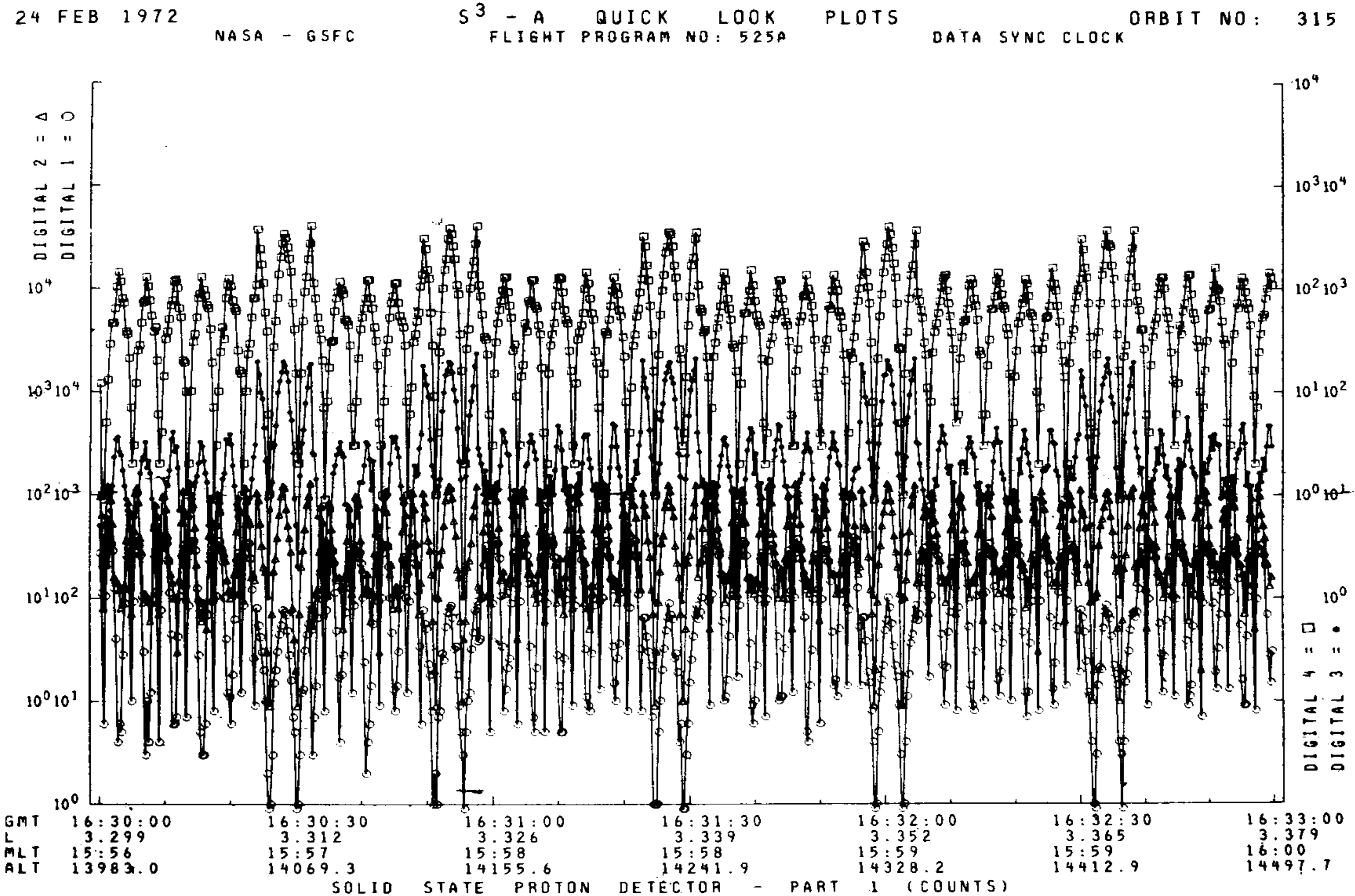

24 FEB 1972
NASA - GSFC
S3 - A QUICK LOOK PLOTS
FLIGHT PROGRAM NO: 525A
ORBIT NO: 315
DATA SYNC CLOCK
SSED
X-Y AXIS ELECTRONS
CHANNELTRONS PROTONS
Z - AXIS
HI EN
LO EN
GMT 16:30:00 16:30:30 16:31:00 16:31:30 16:32:00 16:32:30 16:33:00
L 3.299 3.312 3.326 3.339 3.352 3.365 3.379
MLT 15:56 15:57 15:58 15:58 15:59 15:59 16:00
ALT 13983.0 14069.3 14155.6 14241.9 14328.2 14412.9 14497.7
CHANNELTRONS AND SOLID STATE ELECTRON DETECTOR (COUNTS)

Figure 4



24 FEB 1972
NASA - GSFC
S3 - A QUICK LOOK PLOTS
FLIGHT PROGRAM NO: 525A
ORBIT NO: 315
DATA SYNC CLOCK
DIGITAL 2 = △
DIGITAL 1 = ○
DIGITAL 4 = □
DIGITAL 3 = •
GMT 16:30:00 16:30:30 16:31:00 16:31:30 16:32:00 16:32:30 16:33:00
L 3.299 3.312 3.326 3.339 3.352 3.365 3.379
MLT 15:56 15:57 15:58 15:58 15:59 15:59 16:00
ALT 13983.0 14069.3 14155.6 14241.9 14328.2 14412.9 14497.7
SOLID STATE PROTON DETECTOR - PART 1 (COUNTS)

Figure 5

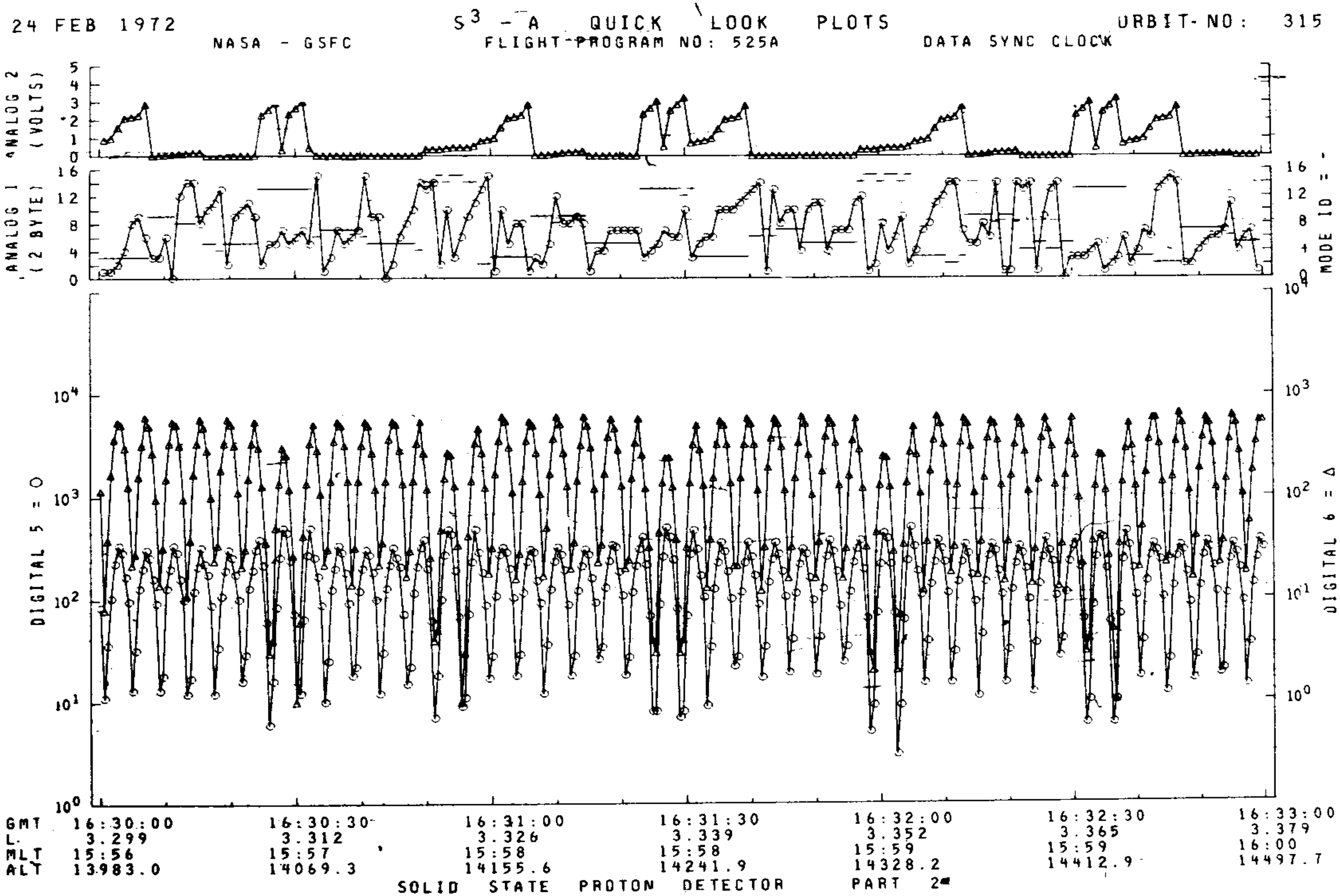
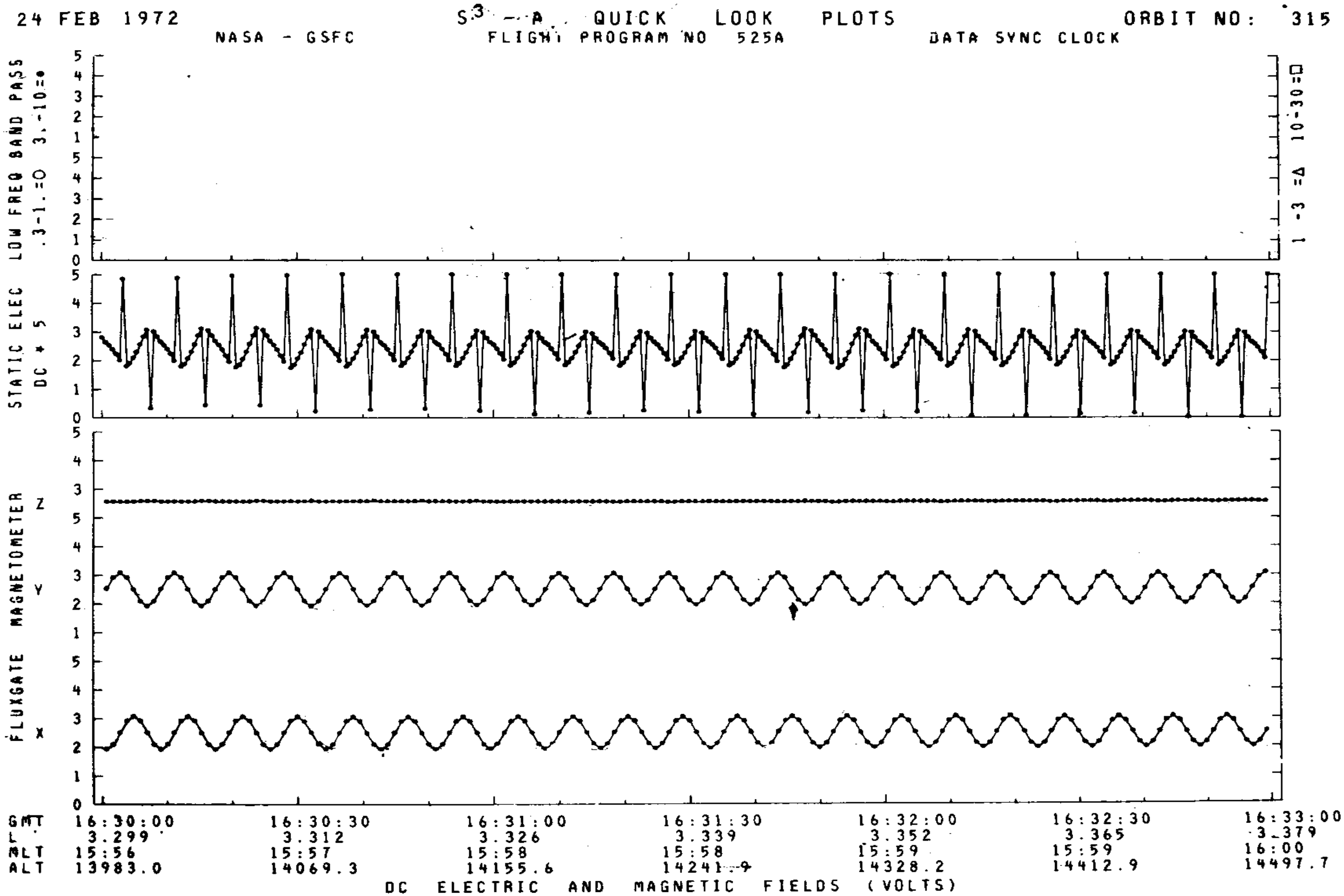

24 FEB 1972
S3 - A QUICK LOOK PLOTS
ORBIT-NO: 315
NASA - GSFC
FLIGHT-PROGRAM NO: 525A
DATA SYNC CLOCK
ANALOG 2 (VOLTS)
ANALOG 1 (2 BYTE)
MODE ID = -
DIGITAL 5 = O
DIGITAL 6 = Δ
GMT 16:30:00 16:30:30 16:31:00 16:31:30 16:32:00 16:32:30 16:33:00
L. 3.299 3.312 3.326 3.339 3.352 3.365 3.379
MLT 15:56 15:57 15:58 15:58 15:59 15:59 16:00
ALT 13983.0 14069.3 14155.6 14241.9 14328.2 14412.9 14497.7
SOLID STATE PROTON DETECTOR
PART 2

Figure 6



24 FEB 1972
S3 - A QUICK LOOK PLOTS
ORBIT NO: 315
NASA - GSFC
FLIGHT PROGRAM NO 525A
DATA SYNC CLOCK
LOW FREQ BAND PASS
.3-1.=O 3.-10=•
1 -3 =Δ 10-30=□
STATIC ELEC
DC * 5
FLUXGATE MAGNETOMETER
Z
Y
X
GMT 16:30:00 16:30:30 16:31:00 16:31:30 16:32:00 16:32:30 16:33:00
L 3.299 3.312 3.326 3.339 3.352 3.365 3.379
MLT 15:56 15:57 15:58 15:58 15:59 15:59 16:00
ALT 13983.0 14069.3 14155.6 14241.9 14328.2 14412.9 14497.7
DC ELECTRIC AND MAGNETIC FIELDS (VOLTS)

Figure 7

ORBIT # 315 DAY 55 1973 CHANNELTRON PROTONS 57084045 SUN
QUADRANT 4 TIME = 15:51:24 P.A. FLAG: 1
OPPOSITE DIRECTION

FLUX
ENERGY (KEV) -->

	1.20	1.80	2.70	4.00	6.00	9.20	13.50	25.60	
	2	4	[illegible]	8	10	12	14	16	SUM
PA100.4 1	7.61E 06	3.84E 06	2.[illegible]E 06	1.29E 06	8.68E 05	3.96E 05	2.97E 05	1.35E 05	1.68E 07
! 89.8 2	7.37E 06	3.24F 06	1.[illegible]E 06	1.34E 06	7.32E 05	4.32E 05	2.84E 05	1.01E 05	1.54E 07
! 79.1 3	6.18E 06	3.48F 06	1.[illegible]E 06	1.43E 06	6.78E 05	4.50E 05	2.72E 05	1.01E 05	1.46E 07
V 68.5 4	6.18E 06	2.76E 06	1.[illegible]7E 06	[illegible].40E 05	4.34E 05	3.96E 05	1.98E 05	6.73E 04	1.27E 07
57.8 5	4.52E 06	2.28E 06	1.33E 06	6.43E 05	4.88E 05	3.06E 05	1.79E 05	6.17E 04	1.03E 07
47.2 6	4.52E 06	2.68F 06	1.[illegible]E 06	5.19E 05	4.34E 05	2.88E 05	1.67E 05	8.97E 04	1.03E 07
36.6 7	2.62E 06	1.56E 06	1.[illegible]3E 06	3.69E 05	3.26E 05	2.52E 05	1.48E 05	5.33E 04	6.76E 06
25.9 8	2.38E 06	1.38E 06	1.[illegible]E 06	[illegible].63E 05	3.80E 05	1.89F 05	9.27E 04	4.20E 04	6.16E 06
15.3									
SUM	4.14E 07	2.14E 07	1.[illegible]E 07	7.49E 06	4.34E 06	2.71E 06	1.64E 06	6.50E 05	

ENERGY DENSITY
ENERGY (KEV) -->

	1.20	1.80	2.70	4.00	6.00	9.20	13.50	25.60	SUM *E(I)
	2	4	[illegible]	8	10	12	14	16	ERGS/(CM**3-STER)
PA100.4 1	3.12E-10	1.91F-10	1.[illegible]3E-10	9.41E-11	7.79E-11	4.43E-11	4.01E-11	2.50E-11	1.65E-09
! 89.8 2	3.03E-10	1.61E-10	1.[illegible]E-10	9.78E-11	6.58E-11	4.83E-11	3.84F-11	1.88E-11	1.49E-09
! 79.1 3	2.54E-10	1.73E-10	1.[illegible]E-10	1.05E-10	6.09E-11	5.03E-11	3.67E-11	1.88E-11	1.46E-09
V 68.5 4	2.54E-10	1.37F-10	1.[illegible]E-10	[illegible].83E-11	3.90E-11	4.43E-11	2.67E-11	1.25E-11	1.13E-09
57.8 5	1.85E-10	1.14E-10	1.1[illegible]E-10	4.71E-11	4.38E-11	3.42E-11	2.42E-11	1.15E-11	9.79E-10
47.2 6	1.85E-10	1.43E-10	8.1[illegible]E-11	4.53E-11	3.90E-11	3.22E-11	2.25E-11	1.67E-11	1.00E-09
36.6 7	1.07E-10	7.77F-11	7.[illegible]E-11	4.16E-11	2.92E-11	2.82E-11	2.00E-11	9.91F-12	7.34E-10
25.9 8	9.76E-11	6.87E-11	[illegible]E-11	4.39E-11	3.41E-11	2.11E-11	1.25E-11	7.82E-12	6.29E-10
15.3									
SUM*DGA(J) ERGS/(CM**3-KEV)	1.68E-09	1.03E-09	7.77E-10	5.37E-10	3.80E-10	2.94E-10	2.17E-10	1.17E-10	8.84E-09
SUM*DGA(J)*DE(I) ERGS/CM**3	1.22E-09	8.79E-10	8.[illegible]E-10	9.85E-10	1.02E-09	1.14E-09	1.43E-09	1.41E-09	

PN= 7.45E-09
PS= 1.39E-09 9 9 9 9 9 9 9 9
P= 8.84E-09 QUADRANT 4 AV. MIN. P.A. 6.161

ORBIT # 315 DAY 55 1972 CHANNELTRON PROTONS
SUM*OGA(J)

SUM OF QUADRANTS 3 & 4

ERGS/(CM**3-KEV)

ENERGY (KEV) -->

	1.20	1.80	2.70	4.00	6.00	9.20	13.50	25.60		MIN PA IF > 20 DEG	OMEGA	PA FLAG
	2	4	[illegible]	8	10	12	14	16				
15:51:24	3.51E-09	2.05E-09	1.3[illegible]E-09	1.16E-09	7.76E-10	6.16E-10	4.41E-10	2.74E-10	S			1
15:52:31	3.51E-09	1.94E-09	1.4[illegible]E-09	1.25E-09	7.55E-10	5.80E-10	4.38E-10	2.50E-10	S			1
15:53:38	3.26E-09	1.80E-09	1.37E-09	1.20E-09	6.91E-10	5.27E-10	4.24E-10	2.38E-10	S			1
15:54:45	3.29E-09	1.80E-09	1.3[illegible]E-09	9.97E-10	7.36E-10	5.00E-10	3.87E-10	2.25E-10	S			1
15:57: 0	2.95E-09	1.69E-09	1.41E-09	9.77E-10	6.29E-10	4.96E-10	3.35E-10	1.98E-10	S			1
15:58: 7	2.88E-09	1.60E-09	1.2[illegible]E-09	9.28E-10	6.10E-10	4.71E-10	3.27E-10	1.78E-10	S			1
15:59:15	2.74E-09	1.58E-09	1.1[illegible]E-09	8.45E-10	5.19E-10	4.16E-10	3.17E-10	1.73E-10	S			1
16: 0:22	2.82E-09	1.50E-09	1.1[illegible]E-09	8.70E-10	5.12E-10	4.09E-10	3.07E-10	1.86E-10	S			1
16: 3:35	2.51E-09	1.28E-09	1.11E-09	7.72E-10	4.59E-10	3.93E-10	2.95E-10	1.79E-10	S			1
16: 4:42	2.42E-09	1.30E-09	1.[illegible]E-09	7.79E-10	4.84E-10	3.85E-10	3.18E-10	1.67E-10	S			1
16: 5:49	2.60E-09	1.41E-09	1.07E-09	7.17E-10	5.26E-10	3.80E-10	2.83E-10	1.49E-10	S			1
16: 6:57	2.65E-09	1.50E-09	1.2[illegible]E-09	7.78E-10	5.34E-10	3.72E-10	3.18E-10	1.67E-10	S			1
16: 8: 4	2.85E-09	1.65E-09	1.27E-09	9.07E-10	5.72E-10	4.14E-10	3.04E-10	1.86E-10	S			1
16: 9:11	3.23E-09	1.88E-09	1.2[illegible]E-09	9.56E-10	5.92E-10	5.00E-10	3.75E-10	2.38E-10	S			1
16:10:18	3.63E-09	2.12E-09	1.4[illegible]E-09	1.14E-09	6.88E-10	5.33E-10	3.78E-10	2.11E-10	S			1
16:11:25	4.00E-09	2.11E-09	1.6[illegible]E-09	1.22E-09	7.61E-10	5.75E-10	4.44E-10	2.53E-10	S			1
16:12:33	3.91E-09	2.27E-09	1.[illegible]E-09	1.23E-09	7.98E-10	5.72E-10	4.81E-10	2.40E-10	S			1
16:13:40	4.11E-09	2.31E-09	1.7[illegible]E-09	1.37E-09	7.83E-10	6.14E-10	4.58E-10	2.60E-10	S			1
16:17: 2	3.93E-09	2.48E-09	1.7[illegible]E-09	1.32E-09	7.82E-10	6.33E-10	5.16E-10	2.65E-10	S			1
16:18: 9	4.19E-09	2.27E-09	1.7[illegible]E-09	1.32E-09	8.74E-10	5.99E-10	4.96E-10	2.37E-10	S			1
16:19:16	4.37E-09	2.40E-09	1.3[illegible]E-09	1.33E-09	8.65E-10	6.50E-10	4.93E-10	2.69E-10	S			1
16:20:23	4.32E-09	2.37E-09	1.[illegible]E-09	1.36E-09	8.53E-10	6.32E-10	5.94E-10	2.59E-10	S			1
16:21:56	4.50E-09	2.55E-09	1.9[illegible]E-09	1.29E-09	9.11E-10	7.25E-10	1.03E-09	3.42E-10	S			1
16:23: 3	4.25E-09	2.48E-09	1.[illegible]E-09	1.40E-09	8.94E-10	7.54E-10	1.14E-09	1.34E-09	S			1
16:24:27	4.89E-09	2.63E-09	2.11E-09	1.46E-09	9.67E-10	8.66E-10	1.26E-09	4.18E-09	S			1
16:25:34	4.64E-09	2.59E-09	2.07E-09	1.55E-09	9.26E-10	9.78E-10	1.29E-09	4.60E-09	S			1
16:26:41	5.16E-09	2.91E-09	2.0[illegible]E-09	1.50E-09	1.00E-09	1.05E-09	1.34E-09	4.79E-09	S			1
16:28:14*1	4.89E-09	2.69E-09	2.0[illegible]E-09	1.52E-09	9.44E-10	1.07E-09	1.51E-09	5.17E-09		23.4	0.517	
*2										23.4	0.517	1
16:29:21*1	4.81E-09	2.74E-09	2.0[illegible]E-09	1.48E-09	9.86E-10	1.06E-09	1.84E-09	5.30E-09		23.4	0.518	
*2										23.4	0.518	1
16:30:28	5.06E-09	2.80E-09	2.0[illegible]E-09	1.51E-09	1.02E-09	1.10E-09	2.20E-09	5.52E-09				1

Figure 9

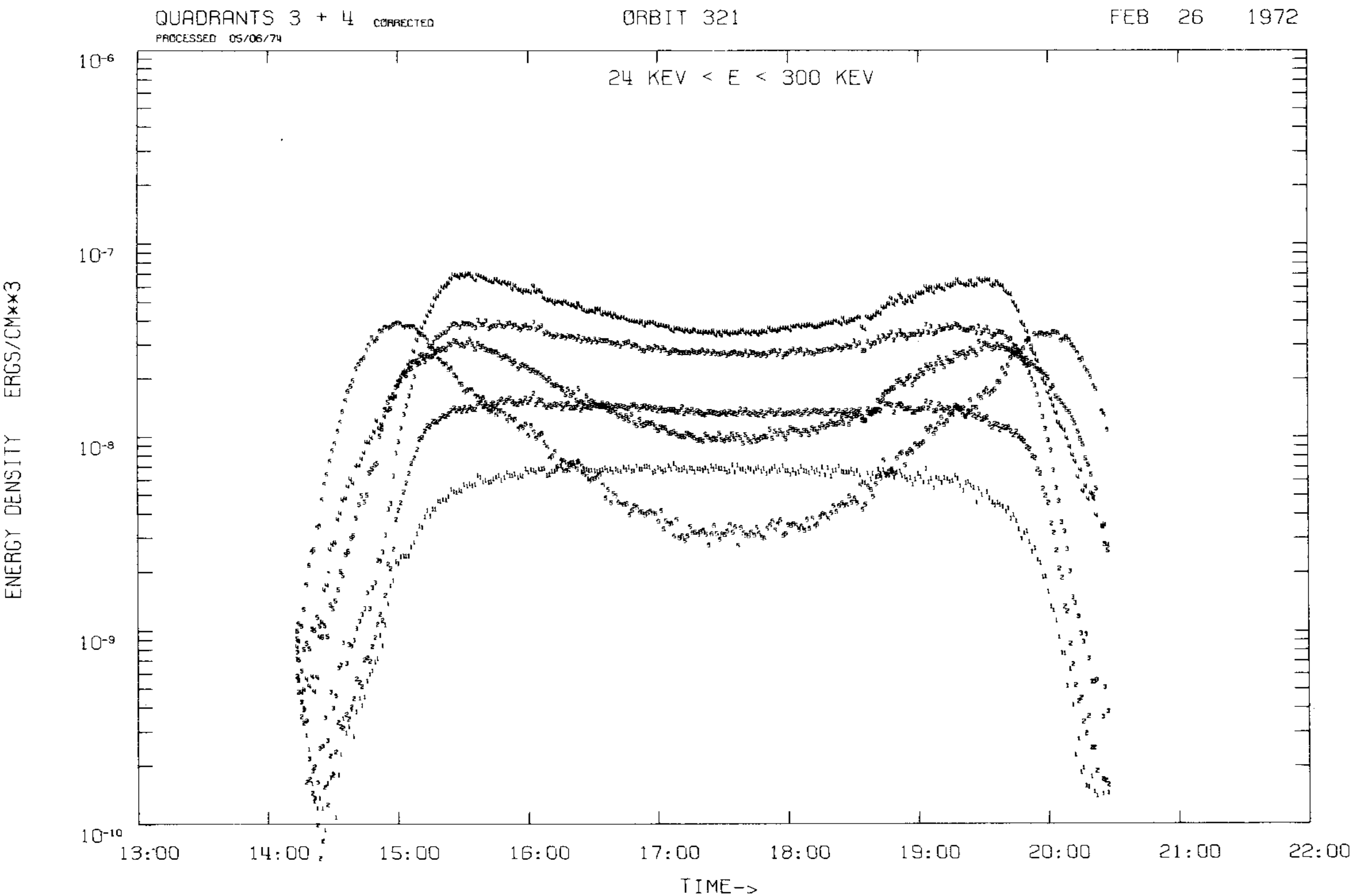

QUADRANTS 3 + 4 CORRECTED
PROCESSED 05/06/74
ØRBIT 321
FEB 26 1972
24 KEV < E < 300 KEV
ENERGY DENSITY ERGS/CM**3
10^{-6}
10^{-7}
10^{-8}
10^{-9}
10^{-10}
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
TIME->

Figure 10

ORBIT # 315 DAY 55 1972 SUMMARY QUADRANTS 3+4

HR MIN	CHAN ERGS/CM**3 1-24 KEV	SSPD-A ERGS/CM**3 24-300 KEV	SSPD-1 ERGS/CM**3 EXTRAPOLATED 300-872 KEV	TOTAL ENERGY DENSITY 1-872 KEV	SSPD-A (1-4) ERGS/CM**3 24-138 KEV	CHAN + SSPD-A (1-4) 1-138 KEV
15 51	1.70E-08	3.73E-09	2.99E-09	2.37E-08	2.44E-09	1.95E-08
15 52	1.66E-08	3.01E-09	4.23E-09	2.33E-08	1.76E-09	1.83E-08
15 53	1.57E-08	3.13E-09	5.61E-09	2.45E-08	1.70E-09	1.74E-08
15 54	1.49E-08	2.82E-09	8.23E-09	2.60E-08	1.33E-09	1.63E-08
15 57	1.38E-08	3.14E-09	1.25E-08	2.94E-08	1.09E-09	1.49E-08
15 58	1.29E-08	3.69E-09	1.57E-08	3.23E-08	9.25E-10	1.38E-08
15 59	1.21E-08	4.18E-09	1.88E-08	3.51E-08	7.73E-10	1.29E-08
16 0	1.22E-08	4.49E-09	2.31E-08	3.98E-08	7.59E-10	1.29E-08
16 3	1.12E-08	5.75E-09	2.99E-08	4.69E-08	8.92E-10	1.21E-08
16 4	1.12E-08	7.35E-09	3.43E-08	5.29E-08	1.16E-09	1.24E-08
16 5	1.11E-08	8.88E-09	3.75E-08	5.75E-08	1.02E-09	1.21E-08
16 6	1.18E-08	9.29E-09	4.09E-08	6.20E-08	1.60E-09	1.34E-08
16 8	1.26E-08	1.05E-08	4.75E-08	7.05E-08	1.91E-09	1.46E-08
16 9	1.44E-08	1.28E-08	5.23E-08	7.95E-08	2.32E-09	1.67E-08
16 10	1.56E-08	1.35E-08	5.62E-08	8.53E-08	2.21E-09	1.78E-08
16 11	1.73E-08	1.50E-08	6.01E-08	9.24E-08	2.74E-09	2.01E-08
16 12	1.77E-08	1.86E-08	6.40E-08	1.01E-07	2.76E-09	2.04E-08
16 13	1.82E-08	2.07E-08	7.03E-08	1.10E-07	3.22E-09	2.15E-08
16 17	1.86E-08	2.50E-08	7.56E-08	1.19E-07	4.20E-09	2.28E-08
16 18	1.85E-08	2.70E-08	7.75E-08	1.23E-07	4.45E-09	2.29E-08
16 19	1.91E-08	2.92E-08	7.90E-08	1.27E-07	4.98E-09	2.41E-08
16 20	1.98E-08	3.25E-08	8.37E-08	1.36E-07	4.97E-09	2.47E-08
16 21	2.38E-08	3.40E-08	8.70E-08	1.46E-07	5.90E-09	2.97E-08
16 23	3.06E-08	3.91E-08	9.02E-08	1.60E-07	6.51E-09	3.71E-08
16 24	5.03E-08	4.31E-08	9.21E-08	1.86E-07	8.48E-09	5.87E-08
16 25	5.32E-08	4.79E-08	9.36E-08	1.95E-07	1.21E-08	6.54E-08
16 26	5.58E-08	5.65E-08	9.37E-08	2.06E-07	1.49E-08	7.07E-08
16 28	5.88E-08	5.71E-08	9.32E-08	2.09E-07	1.62E-08	7.49E-08
16 29	6.18E-08	5.82E-08	9.23E-08	2.12E-07	1.68E-08	7.86E-08
16 30	6.60E-08	6.46E-08	9.84E-08	2.19E-07	2.03E-08	8.63E-08
16 31	6.98E-08	6.63E-08	9.66E-08	2.23E-07	2.11E-08	9.09E-08
16 32	7.22E-08	6.85E-08	8.35E-08	2.24E-07	2.19E-08	9.41E-08
16 33	7.71E-08	6.80E-08	7.97E-08	2.25E-07	2.31E-08	1.00E-07
16 34	8.05E-08	7.44E-08	7.65E-08	2.31E-07	2.57E-08	1.06E-07
16 36	8.51E-08	8.11E-08	7.33E-08	2.43E-07	3.14E-08	1.17E-07
16 37	8.83E-08	8.36E-08	6.86E-08	2.41E-07	3.42E-08	1.23E-07
16 39	9.28E-08	9.39E-08	6.64E-08	2.53E-07	4.49E-08	1.38E-07
16 40	9.34E-08	9.84E-08	6.53E-08	2.57E-07	4.82E-08	1.42E-07
16 41	9.54E-08	1.00E-07	6.16E-08	2.57E-07	5.12E-08	1.47E-07
16 42	9.30E-08	9.91E-08	5.82E-08	2.50E-07	5.03E-08	1.43E-07

Figure 11

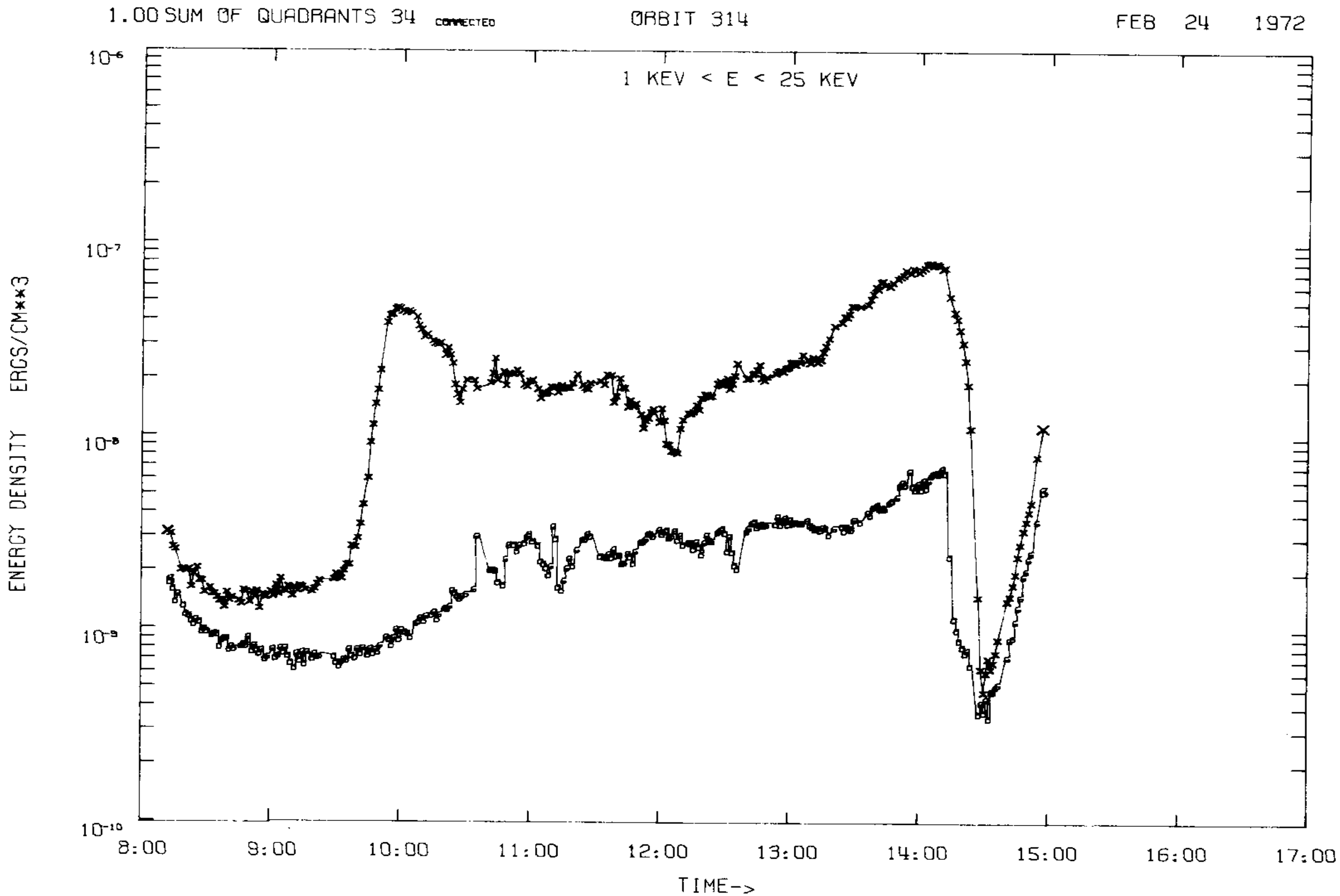

1.00 SUM OF QUADRANTS 34 CORRECTED
ORBIT 314
FEB 24 1972
1 KEV < E < 25 KEV
ENERGY DENSITY ERGS/CM**3
10^{-6}
10^{-7}
10^{-8}
10^{-9}
10^{-10}
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
TIME->

Figure 12

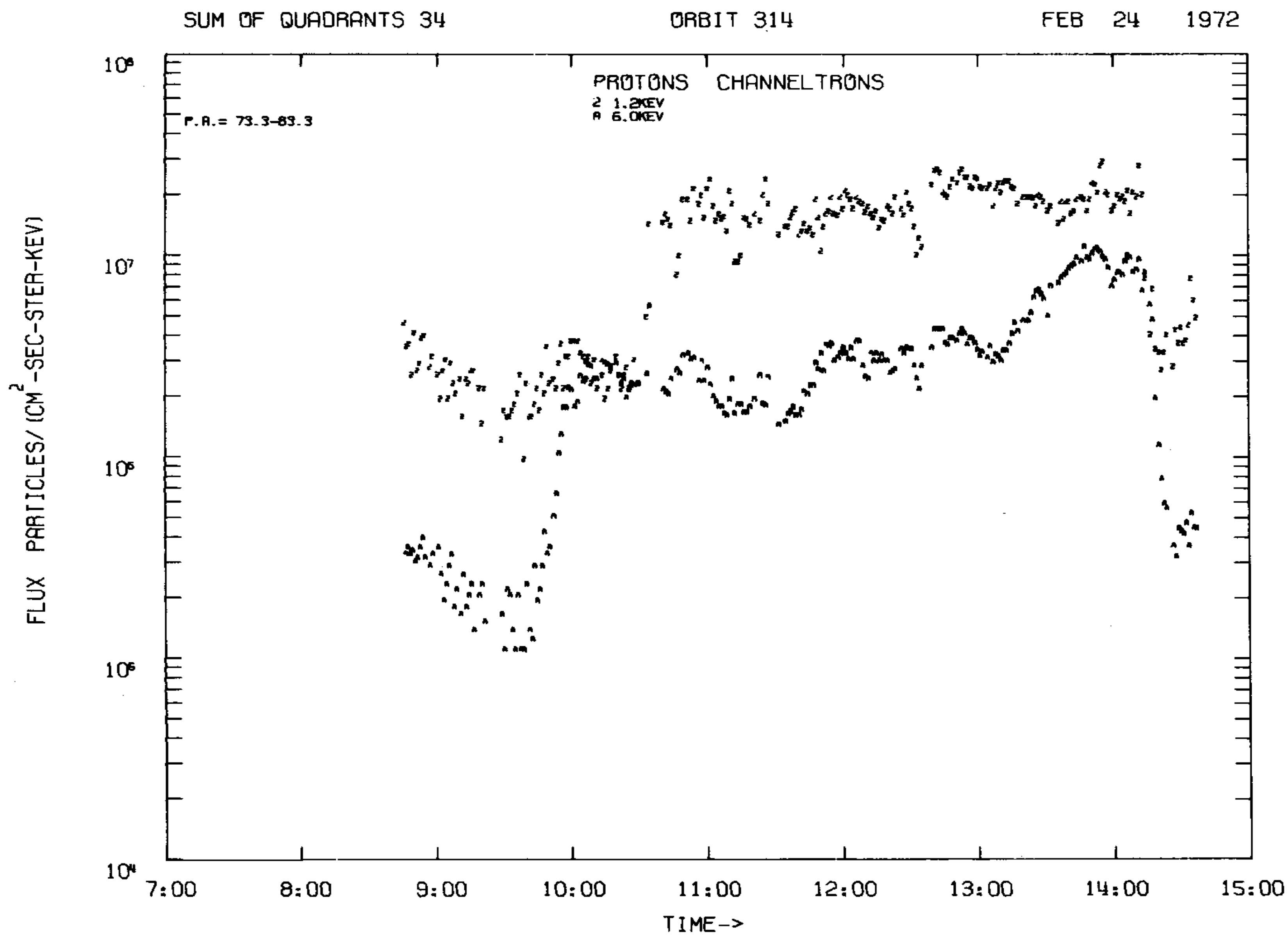
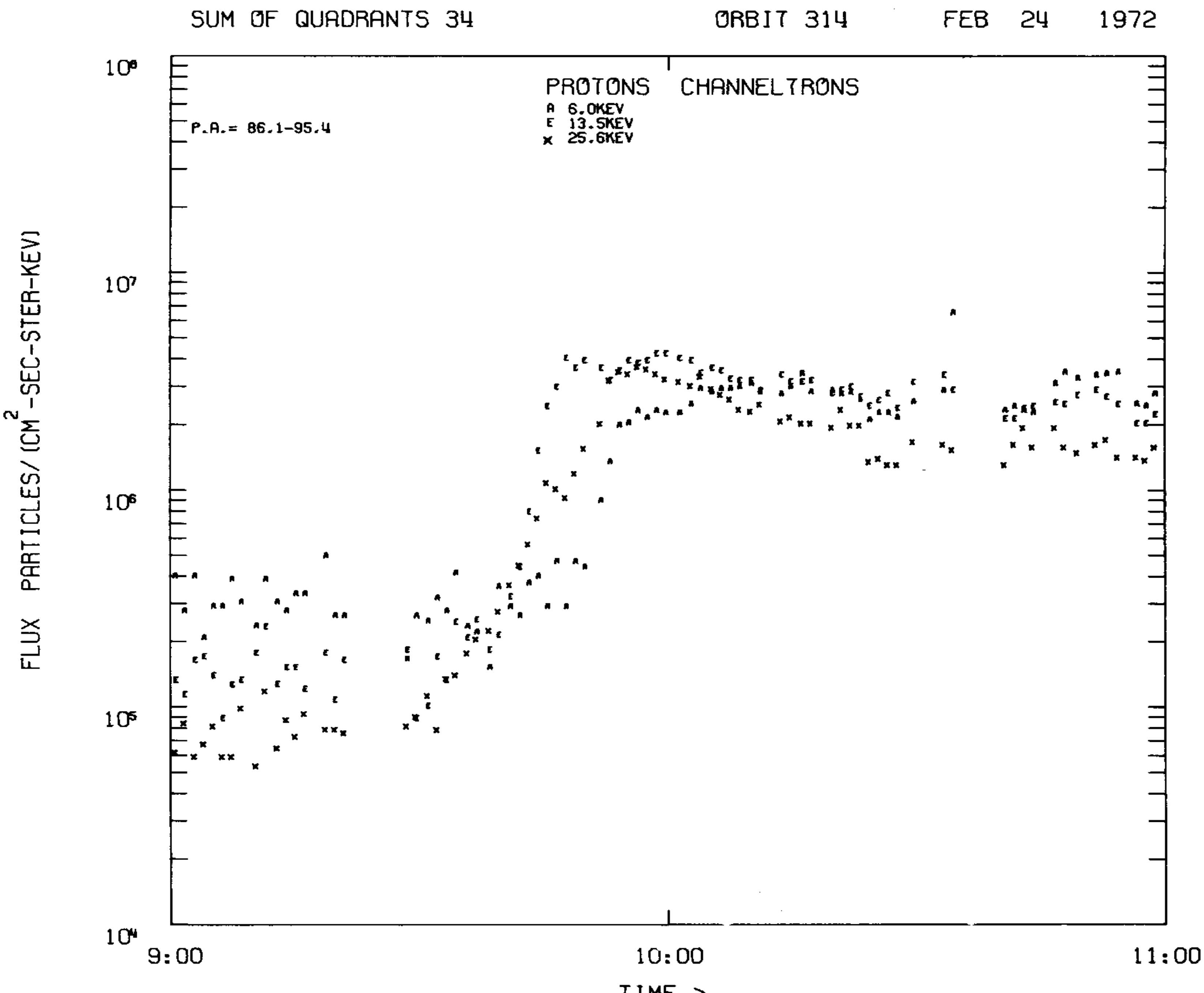

SUM OF QUADRANTS 34
ORBIT 314
FEB 24 1972
PROTONS CHANNELTRONS
2 1.2KEV
A 6.0KEV
P.A.= 73.3-83.3
FLUX PARTICLES/(CM^2-SEC-STER-KEV)
10^8
10^7
10^6
10^5
10^4
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
TIME->

Figure 13



SUM OF QUADRANTS 34
ORBIT 314
FEB 24 1972
PROTONS CHANNELTRONS
A 6.0KEV
E 13.5KEV
x 25.6KEV
P.A.= 86.1-95.4
10^8
10^7
10^6
10^5
10^4
FLUX PARTICLES/(CM^2-SEC-STER-KEV)
9:00
10:00
11:00
TIME->

Figure 14

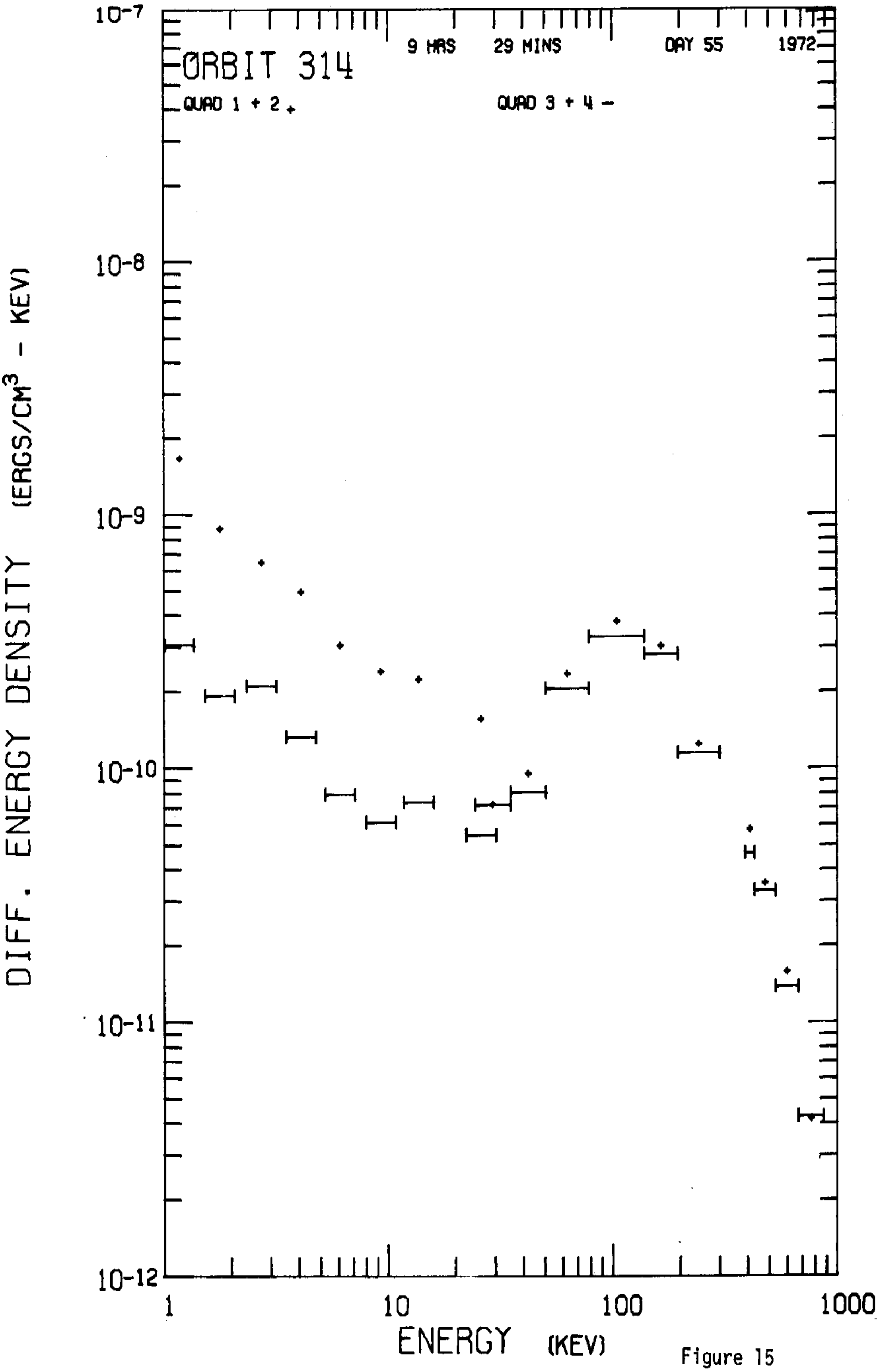

10-7
10-8
10-9
10-10
10-11
10-12
ORBIT 314
9 HRS
29 MINS
DAY 55
1972
QUAD 1 + 2 +
QUAD 3 + 4 −
DIFF. ENERGY DENSITY (ERGS/CM3 - KEV)
1
10
100
1000
ENERGY (KEV)

Figure 15

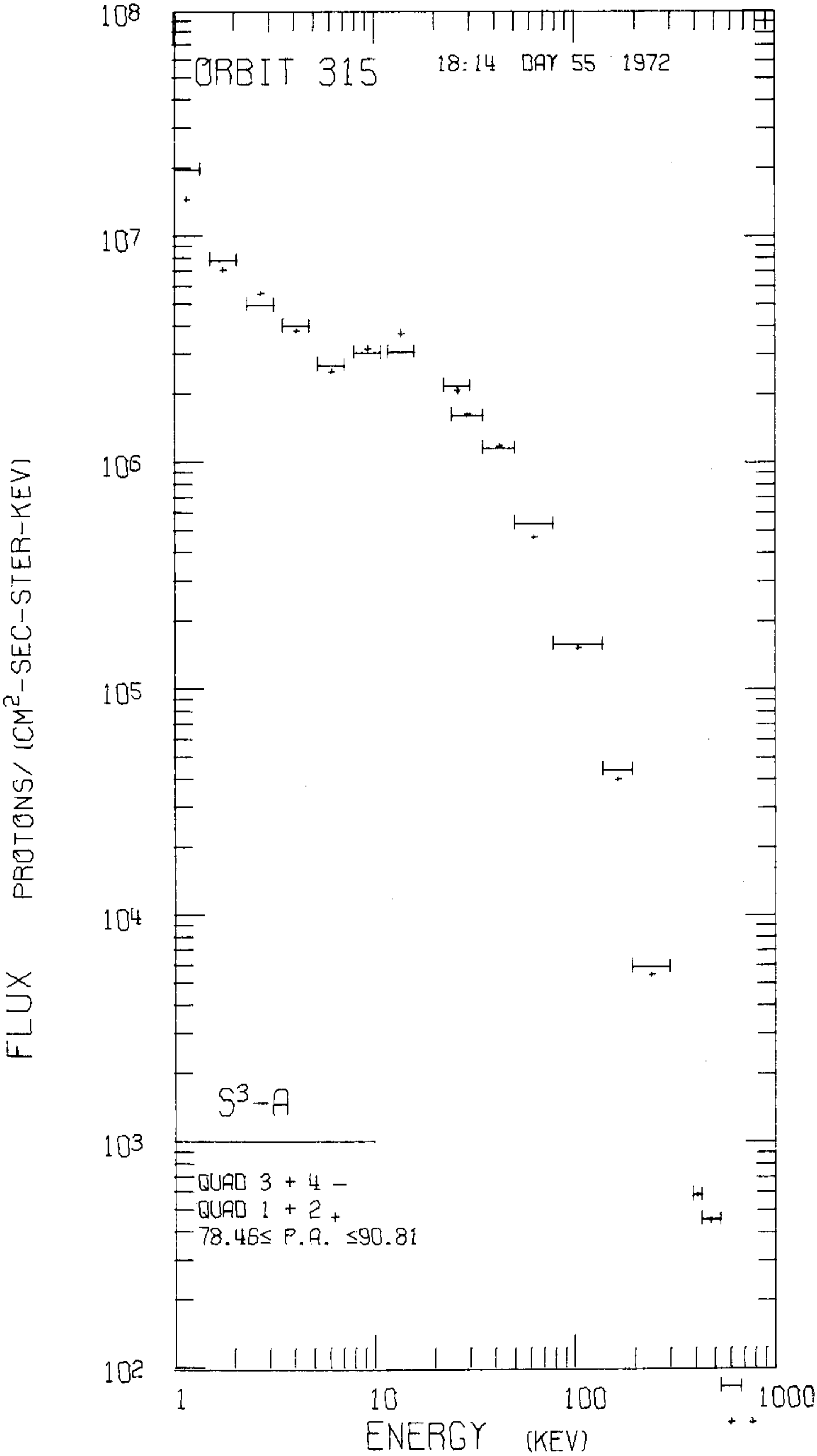

ORBIT 315
18:14 DAY 55 1972
FLUX PROTONS/ (CM^2-SEC-STER-KEV)
S^3-A
QUAD 3 + 4 –
QUAD 1 + 2 +
78.46≤ P.A. ≤90.81
ENERGY (KEV)
10^8
10^7
10^6
10^5
10^4
10^3
10^2
1
10
100
1000

Figure 16

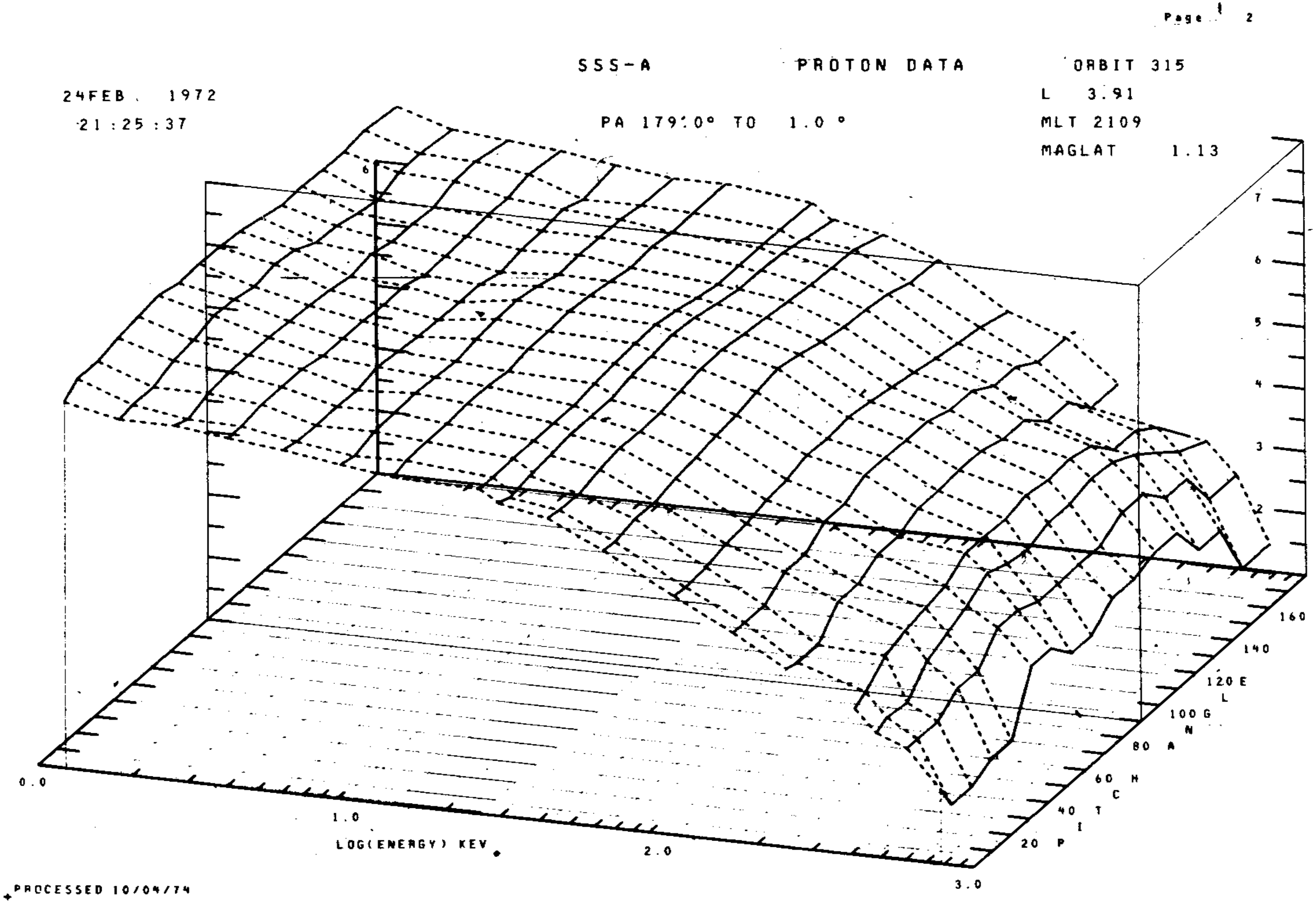
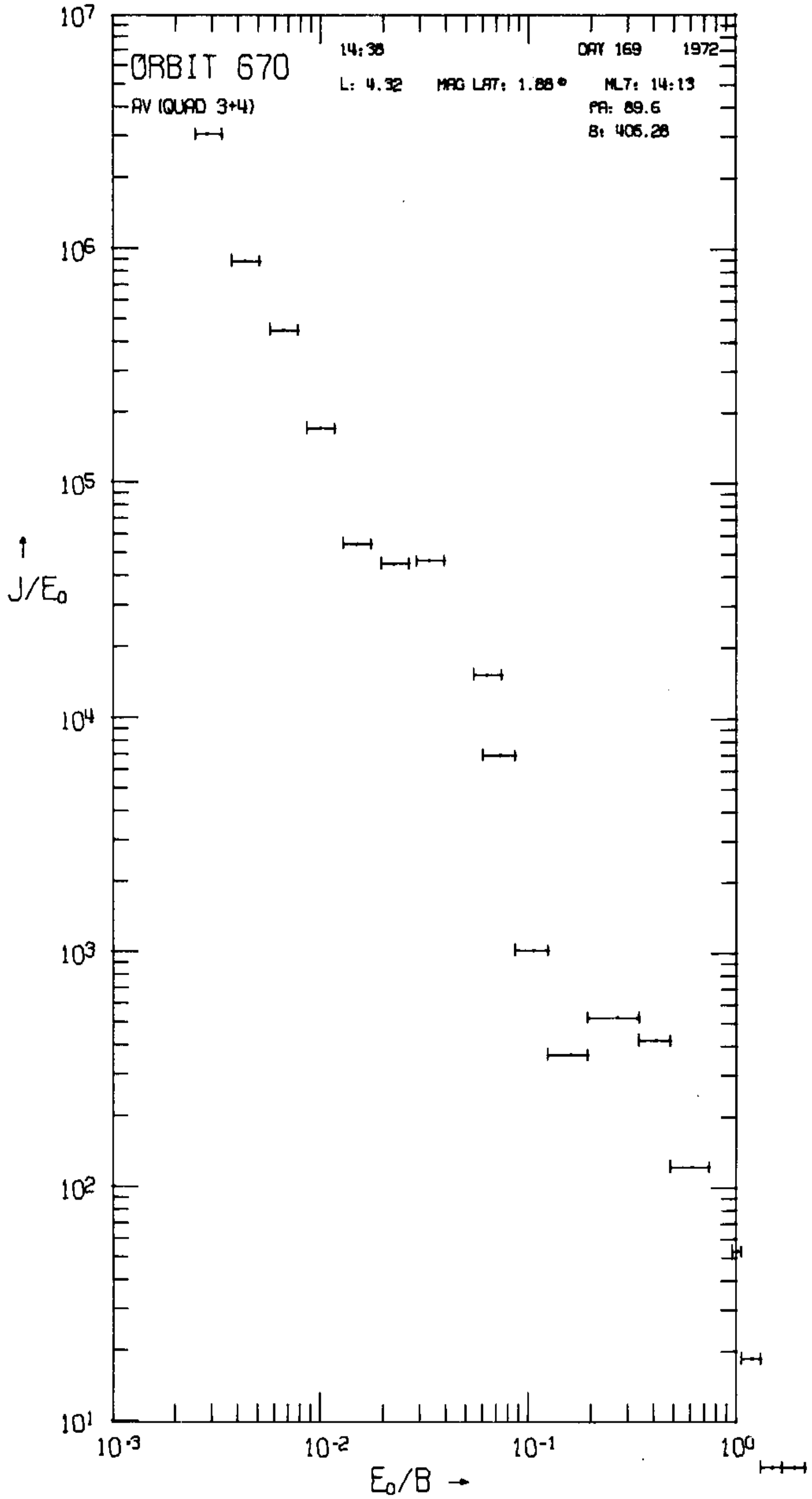

Page 1 2
SSS-A
PROTON DATA
ORBIT 315
24FEB. 1972
21:25:37
PA 179.0° TO 1.0°
L 3.91
MLT 2109
MAGLAT 1.13
LOG(FLUX) #/SEC-STER-CM² KEV
LOG(ENERGY) KEV
0.0
1.0
2.0
3.0
PITCH ANGLE
20
40
60
80
100
120
140
160
2
3
4
5
6
7
PROCESSED 10/04/74

Figure 17



ØRBIT 670
AV (QUAD 3+4)
14:38
L: 4.32
MAG LAT: 1.88°
DAY 169
1972
MLT: 14:13
PA: 89.6
B: 406.28
J/E0
E0/B

Figure 18

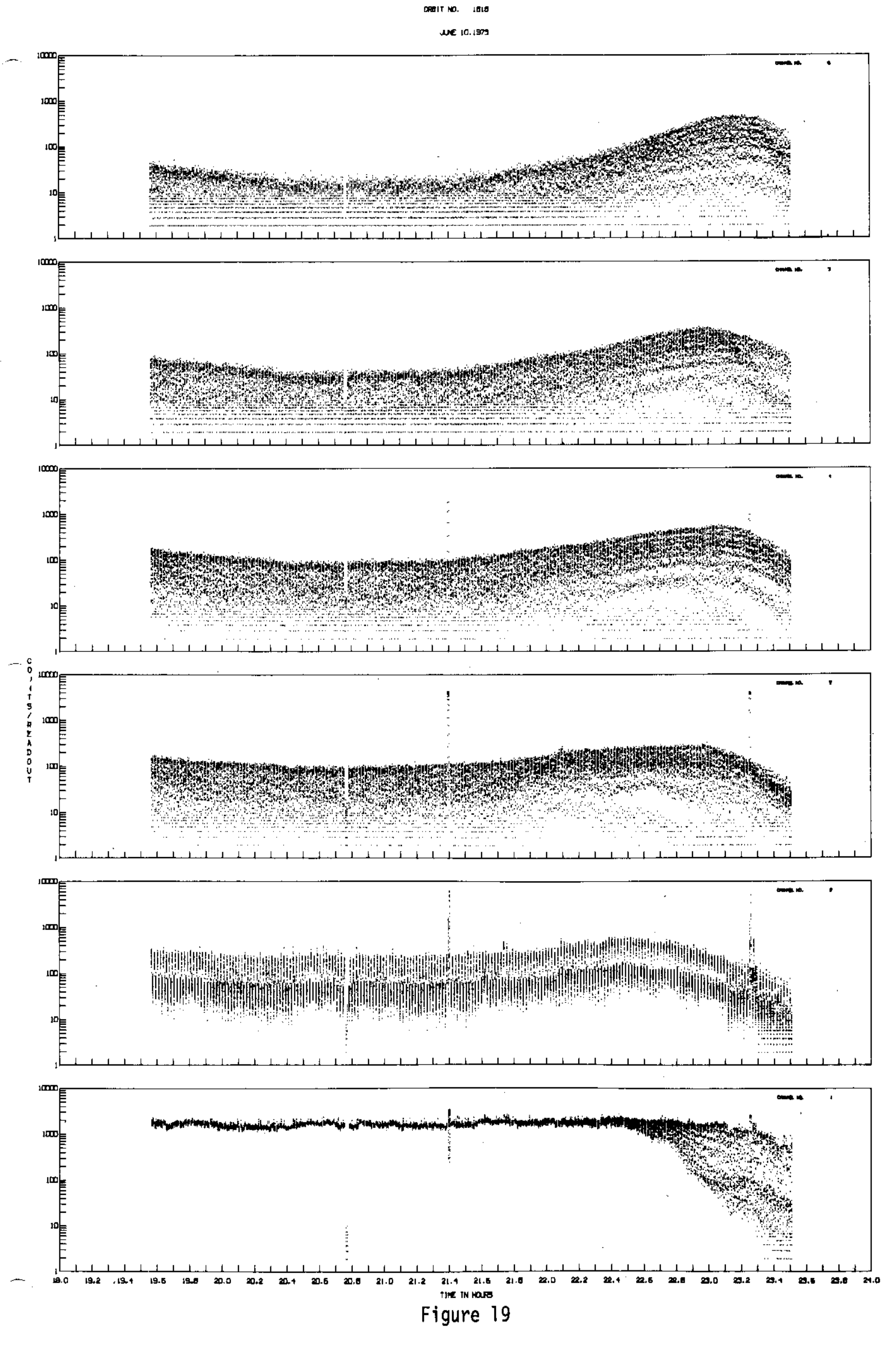


Figure 19

Orbit No. 1751
May 21, 1973

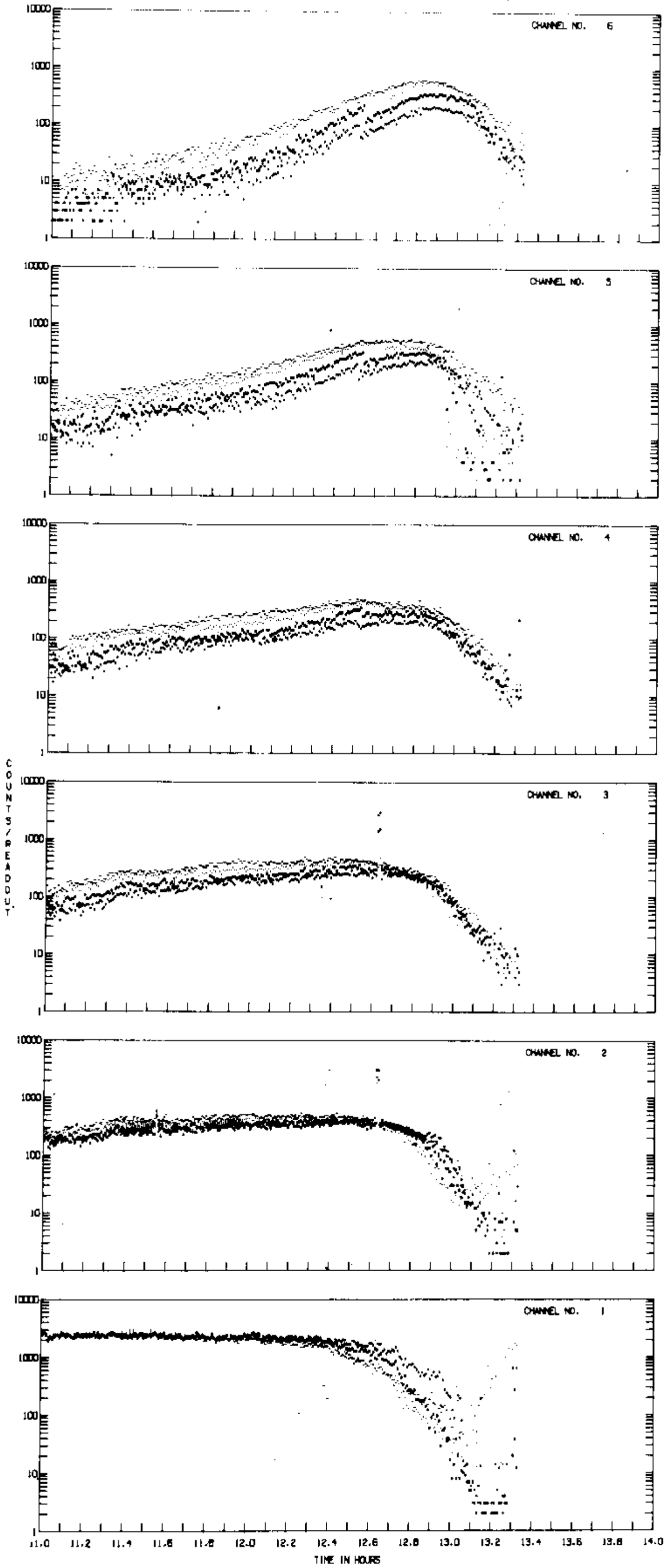
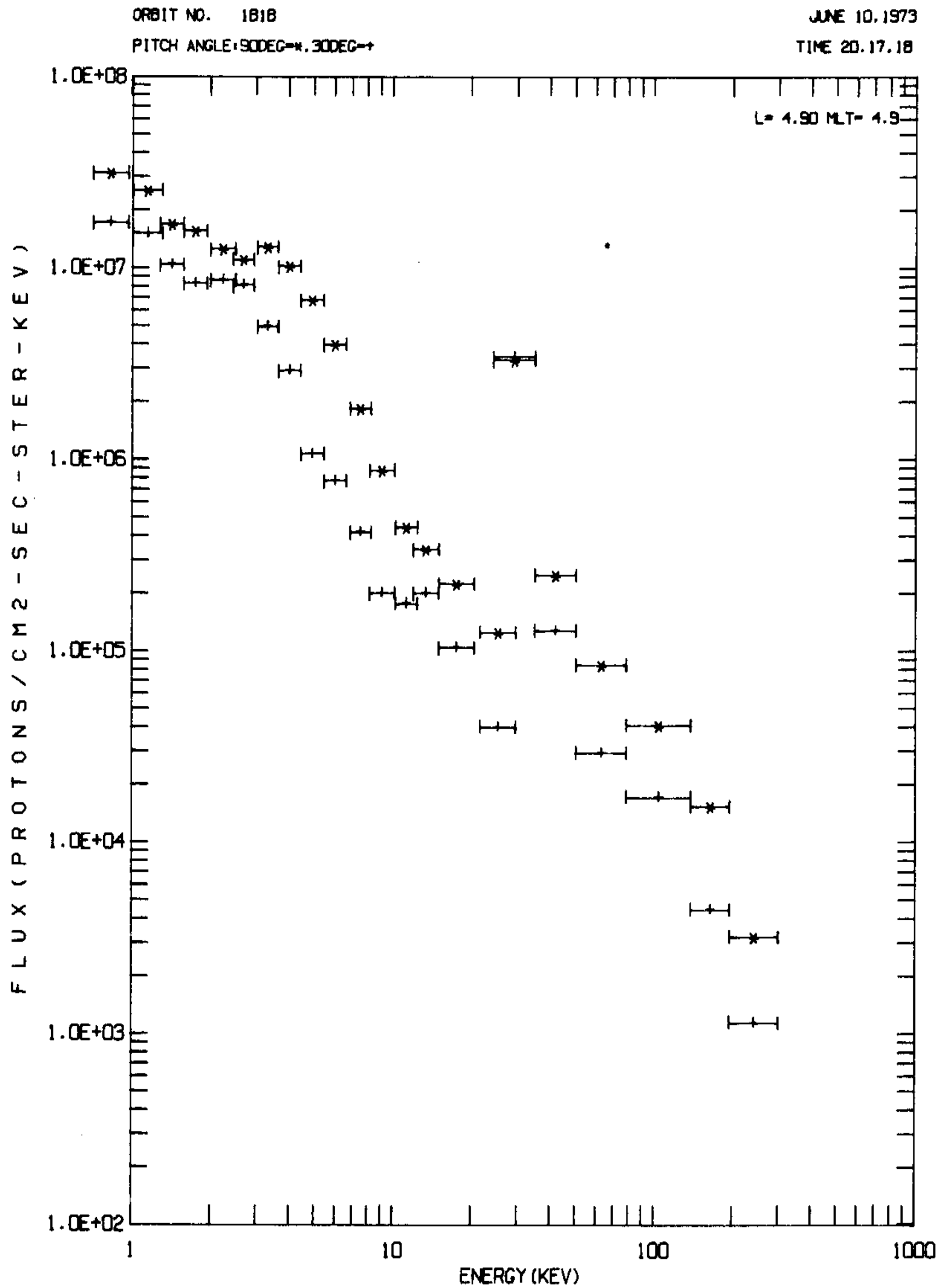


Figure 20



ORBIT NO. 1818
JUNE 10,1973
PITCH ANGLE:90DEG=*,30DEG=+
TIME 20.17.18
L= 4.90 MLT= 4.9
1.0E+08
1.0E+07
1.0E+06
1.0E+05
1.0E+04
1.0E+03
1.0E+02
FLUX (PROTONS/CM2-SEC-STER-KEV)
1
10
100
1000
ENERGY (KEV)

Figure 21

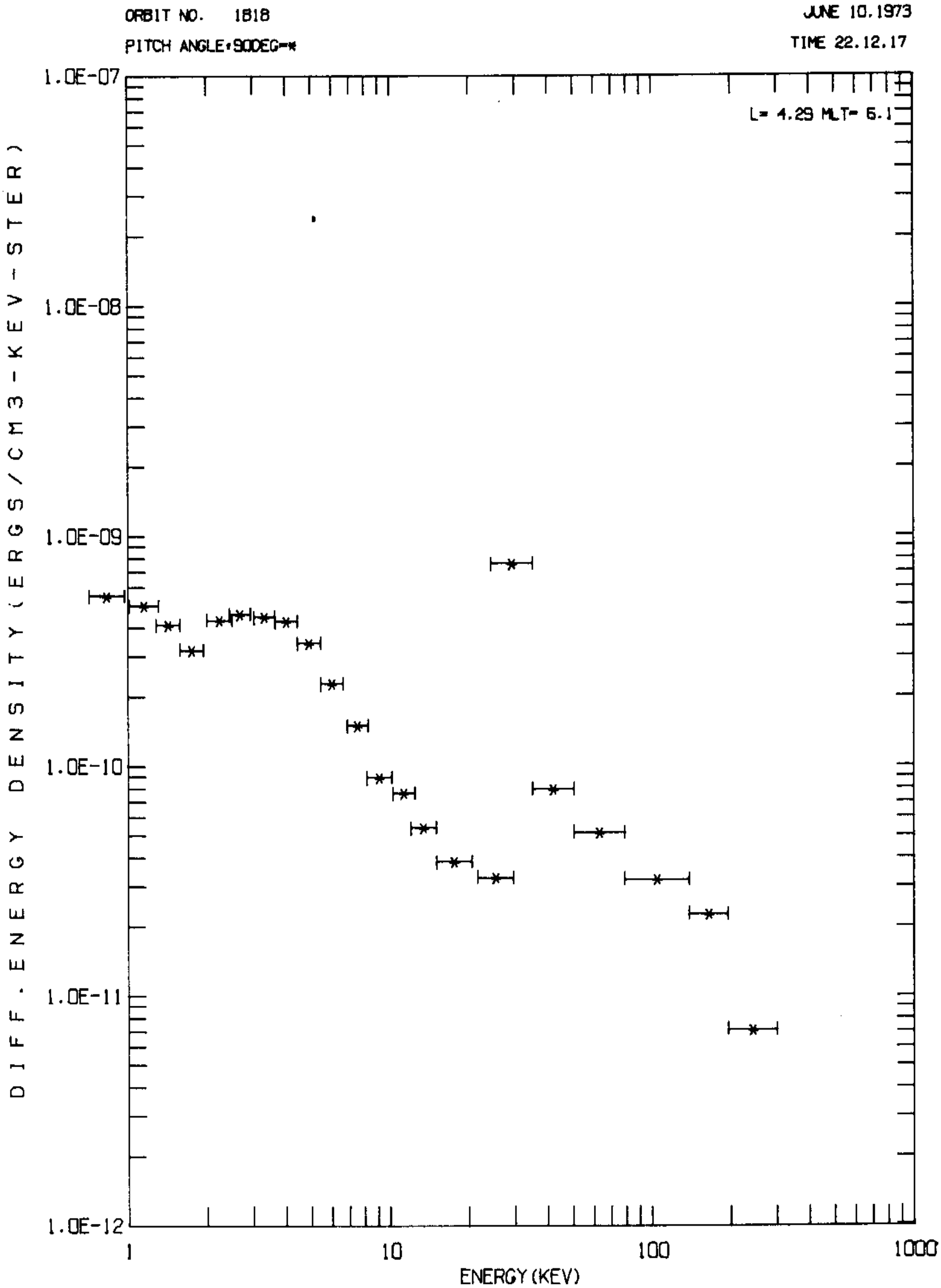

ORBIT NO. 1818
PITCH ANGLE:90DEG=*
JUNE 10,1973
TIME 22.12.17
L= 4.29 MLT= 6.1
DIFF. ENERGY DENSITY (ERGS/CM3-KEV-STER)
1.0E-07
1.0E-08
1.0E-09
1.0E-10
1.0E-11
1.0E-12
1
10
100
1000
ENERGY(KEV)

Figure 22

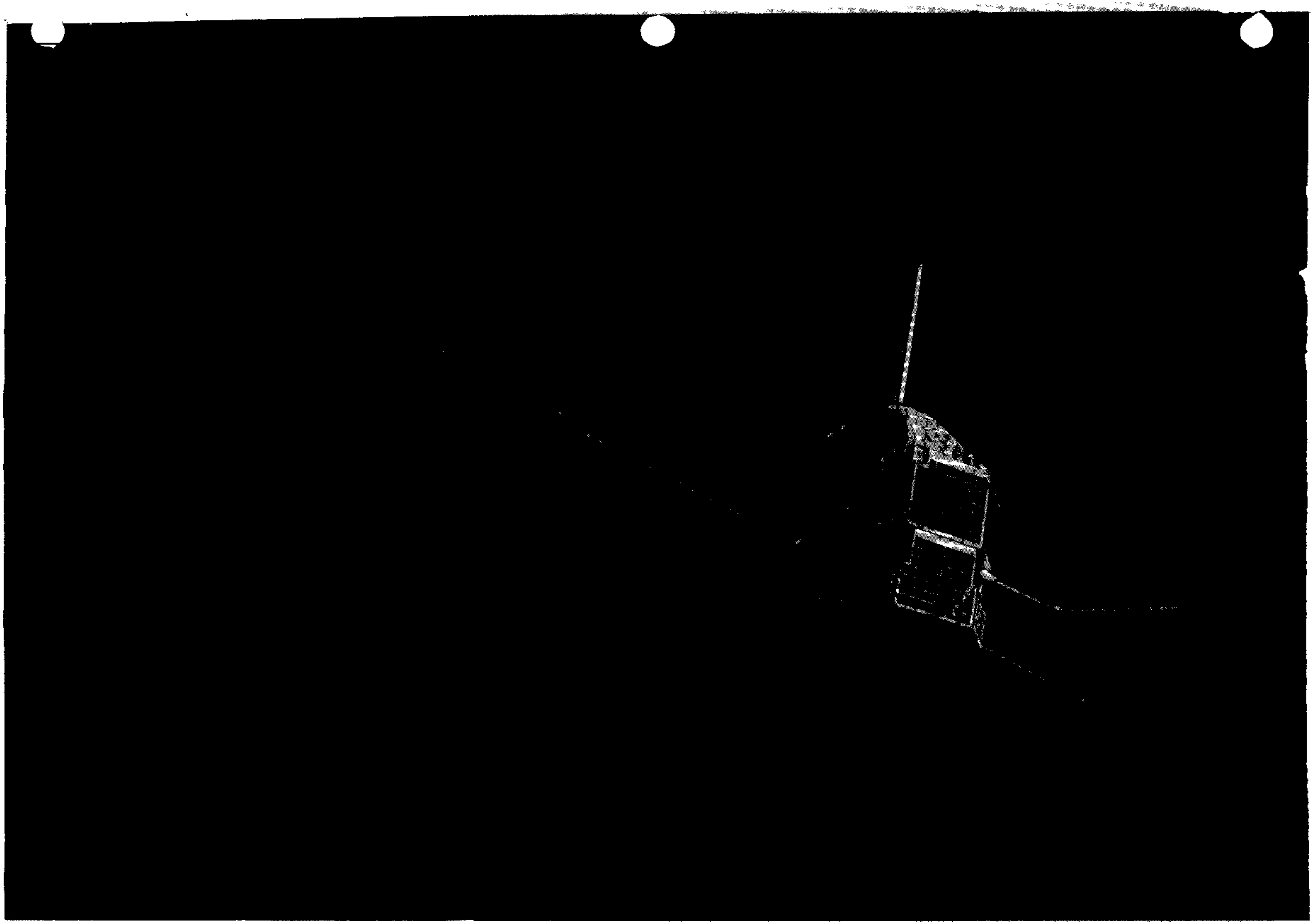


Figure 23

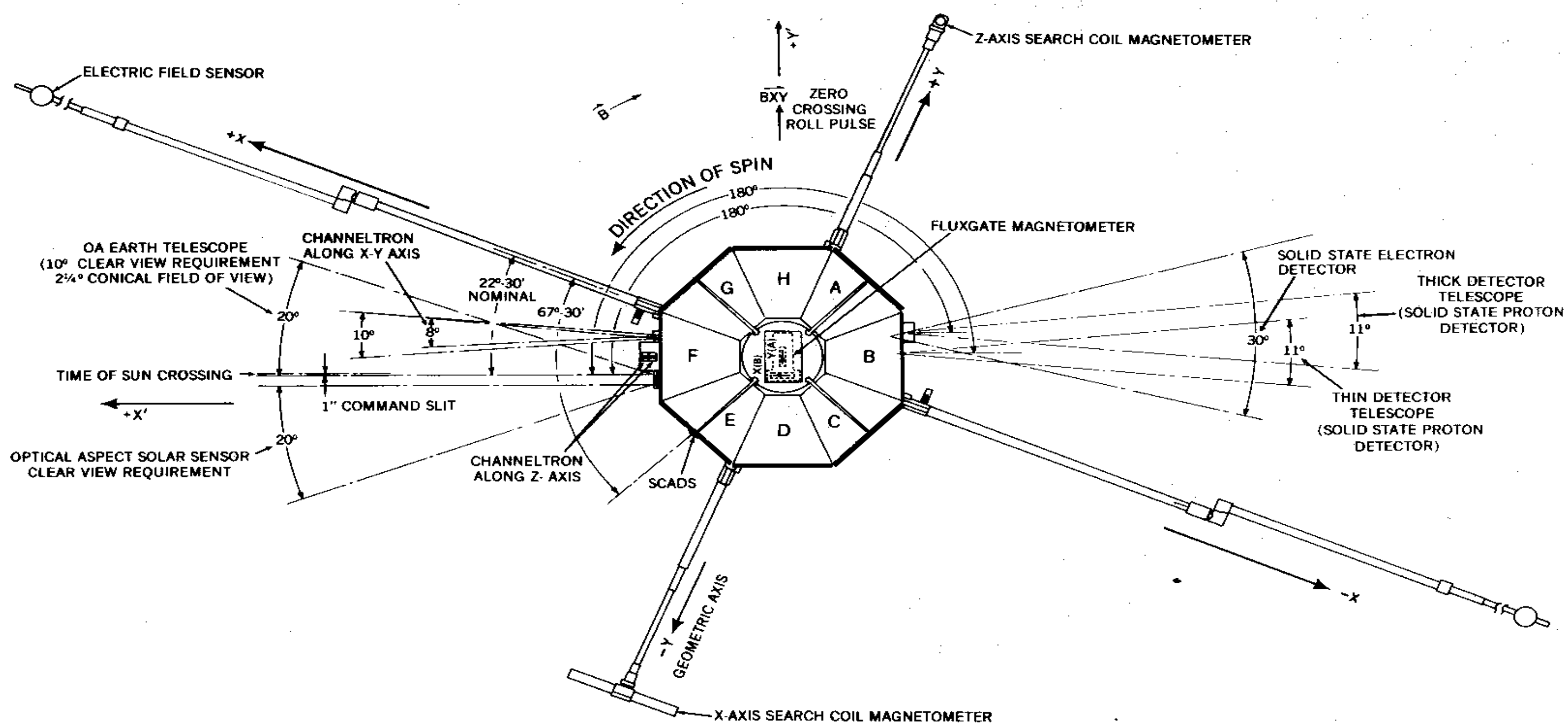

ELECTRIC FIELD SENSOR
Z-AXIS SEARCH COIL MAGNETOMETER
+X
+Y
+Y'
BXY
ZERO CROSSING ROLL PULSE
DIRECTION OF SPIN
180°
180°
FLUXGATE MAGNETOMETER
SOLID STATE ELECTRON DETECTOR
THICK DETECTOR TELESCOPE (SOLID STATE PROTON DETECTOR)
THIN DETECTOR TELESCOPE (SOLID STATE PROTON DETECTOR)
30°
11°
11°
OA EARTH TELESCOPE (10° CLEAR VIEW REQUIREMENT 2¼° CONICAL FIELD OF VIEW)
CHANNELTRON ALONG X-Y AXIS
22°30' NOMINAL
67°30'
10°
8°
20°
20°
TIME OF SUN CROSSING
+X'
1" COMMAND SLIT
OPTICAL ASPECT SOLAR SENSOR CLEAR VIEW REQUIREMENT
CHANNELTRON ALONG Z- AXIS
SCADS
A
B
C
D
E
F
G
H
X(B)
Y(A)
-Y
GEOMETRIC AXIS
-X
X-AXIS SEARCH COIL MAGNETOMETER

Figure 24

FORMAT AND UNITS OF S^3-A (EXPLORER 45) DEFINITIVE DATA (In Data Books)

															yyyy(1)	ddd(2)
DATE MMDD	TIME HHMM	GEOCENTRIC LONG.	GEOCENTRIC LAT.	DIST.	INER. R.A.	VEL VECTOR R.A.	VEL VECTOR DECL.	VEL.	GEOMAG. RO	GEOMAG. LAT.	REAL F(3) L	REAL F(3) B	B/Bo	R.A.	DECL.
509 Date of Year (Month & Day of Month	5.0 Time of Day (Hour and Min)	124.472 Geo. Long. in DEGREES	-3.626 Geo. Long. in DEGREES	8266 Geo. Dist. in KIL.	352.15 Satellite Right Ascention (G.E.I.C.S.) in DEGREES	105.5 Velocity Vector Right Ascention (G.E.I.C.S.) in DEGREES	1.4 Velocity Vector Declin. (G.E.I.C.S.) in DEGREES	8.7 Vel. Vector Mag. in KM/SEC	1.39 Geo. Dist. in EARTH RADII	-15.1 Geo. Lat. in DEGREES	1.280 McLwain L-Value in EARTH RADII	17850 B-Field in GAMMAS	1.202 Ratio of B-Field to B-Field at the Equator	355.9 B-Field Right Ascention (G.E.I.C.S.) in DEGREES	65.0 B-Field Declination (G.E.I.C.S.) in DEGREES

G.E.I.C.S. = Geocentric Equatorial Inertial Coordinate System

(1) Year of Observation (e.g. 1974)

(2) Julian Day of Year (e.g. 129)

(3) POGO (8/69), EPOCH 1969.0 (Cain & Sweeney, JGR, 75 (22), 4360, 1970) Magnetic Field

FORMAT AND UNITS OF S^3-A (EXPLORER 45) DEFINITIVE DATA (In Data Books)

														yyyy(1)	ddd(2)
DATE	TIME	GEOCENTRIC			INER.	VEL VECTOR			GEOMAG.		REAL F(3)				
MMDD	HHMM	LONG.	LAT.	DIST.	R.A.	R.A.	DECL.	VEL.	RO	LAT.	L	B	B/Bo	R.A.	DECL.
509 Date of Year (Month & Day of Month	5.0 Time of Day (Hour and Min)	124.472 Geo. Long. in DEGREES	-3.626 Geo. Long. in DEGREES	8266 Geo. Dist. in KIL.	352.15 Satellite Right Ascention (G.E.I.C.S.) in DEGREES	105.5 Velocity Vector Right Ascention (G.E.I.C.S.) in DEGREES	1.4 Velocity Vector Declin. (G.E.I.C.S.) in DEGREES	8.7 Vel. Vector Mag. in KM/SEC	1.39 Geo. Dist. in EARTH RADII	-15.1 Geo. Lat. in DEGREES	1.280 McLwain L-Value in EARTH RADII	17850 B-Field in GAMMAS	1.202 Ratio of B-Field to B-Field at the Equator	355.9 B-Field Right Ascention (G.E.I.C.S.) in DEGREES	65.0 B-Field Declination (G.E.I.C.S.) in DEGREES

G.E.I.C.S. = Geocentric Equatorial Inertial Coordinate System

(1) Year of Observation (e.g. 1974)

(2) Julian Day of Year (e.g. 129)

(3) POGO (8/69), EPOCH 1969.0 (Cain & Sweeney, JGR, 75 (22), 4360, 1970) Magnetic Field

```
5294Y201
            21 OCT. 75  BACKLOG   CPU/IO     STANDBY  CPU/IO       IDLE   DOWN    OP. PROBLEMS
                 360/91    7    4.93/ 3.50    49   16.55/ 3.45  0.00   0.00     LAST WEEK
                 360/75    3    1.08/ 0.33    32   30.33/ 5.33  0.00   2.70         1

5283K020    IMSL -- NEW VERSION                                                     9 OCT 75
            ***************************************************************************************
            A NEW VERSION OF THE INTERNATIONAL MATHEMATICAL AND STATISTICAL LIBRARIES, INC.,
            FORTRAN-CALLABLE SUBROUTINE LIBRARY HAS BEEN INSTALLED ON THE SYSTEM.  THE NEW
            VERSION CAN BE OBTAINED BY SPECIFYING
               DSN=SYS2.IMSLS.DISP=SHR.UNIT=2314.VOL=SER=M2SYS5
               DSN=SYS2.IMSLD.DISP=SHR.UNIT=2314.VOL=SER=M2SYS5
            INSTEAD OF THE DESCRIPTION CURRENTLY USED.
            IF NO SERIOUS PROBLEMS ARE ENCOUNTERED, THE NEW VERSION WILL BE MADE THE
            STANDARD SYSTEM VERSION ON TUESDAY, 28 OCT 75.
            BECAUSE OF THE COST, NOT ENOUGH MANUALS HAVE BEEN OBTAINED TO GIVE EACH PERSON
            A PRIVATE COPY.  REFERENCE COPIES HAVE BEEN DISTRIBUTED TO THE SCIENCE AND
            APPLICATIONS COMPUTER USERS COMMITTEE.  CONTACT YOUR REPRESENTATIVE FOR
            MANUAL LOCATION INFORMATION.

      //ZEPJDEXP JOB (L10312857A.T.M00110.H(0H00),620,MSGLEVEL=1               620R0567
      ***INVENTRYTHISCATE
      //UPDATE EXEC PGM=IEBUPDTE,REGION=70K
      //SYSPRINT DD SYSOUT=A,DCB=(RECFM=FB,LRECL=121,BLKSIZE=7260)
      //SYSUT1 DD DSN=S3A.INVENTRY,UNIT=2314,DISP=(OLD,PASS),
      //   DCB=(RECFM=FB,LRECL=80,BLKSIZE=7200),VOL=SER=K3SCR2
      //SYSIN DD *
   IEF236I ALLOC. FOR ZEPJDEXP UPDATE
   IEF237I 213    ALLOCATED TO SYSPRINT
   IEF237I 141    ALLOCATED TO SYSUT1
   IEF237I 231    ALLOCATED TO SYSIN

     SYSIN                       Orbit Number     NEW MASTER                          IEBUPDTE LOG PAGE 0001

     ./  CHANGE NAME=EXPTAPES,LIST=ALL,UPDATE=INPLACE
                                  1        W20    1     01                    00000010
                                  2        W20    1     03                    00000020
                                  3        W20    1     05                    00000030
                                  4        W20    1     07                    00000040
                                  5        W20    1     09                    00000050
                                  6        W20    2     01                    00000060
                                  7        W20    2     03                    00000070
                                  8        W20    2     05                    00000080
                                  9        W20    2     07                    00000090
                                 10        W20    2     10                    00000100
                                 11        W20    3     01                    00000110
                                 12        W20    3     03                    00000120
                                 13        W20    3     06                    00000130
                                 14        W20    3     11                    00000140
                                 15        W20    3     09                    00000150
                                 16        W20    4     01                    00000160
                                 17        W20    4     03                    00000170
                                 18        W20    4     05                    00000180
                                 19        W20    4     07                    00000190
                                 20        W20    4     09                    00000200
                                 21        W20    5     01                    00000210
                                 22        W20    5     04                    00000220
                                 23        W20    5     06                    00000230
                                 24        W20005       09                    00000240
                                 24        W20005       11                    00000250
                                 25        W20005       13                    00000260
                                 26        W20    6     01                    00000270
                                 27        W20    6     04                    00000280
                                 28        W20    6     07                    00000290
                                 29        W20    6     09                    00000300
                                 29        W20    6     12                    00000310
                                 30        W20    6     14                    00000320
                                 31        W20    7     01                    00000330
                                 32        W20    7     03                    00000340
                                 33        W20    7     09                    00000350
                                 34        W20    7     05                    00000360
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1437    W20288  03    00014410
1438    W20288  05    00014420
1439    W20288  08    00014430
1440    W20288  11    00014440
1441    W20289  01    00014450
1442    W20289  03    00014460
1443    W20289  05    00014470
1444    W20289  07    00014480
1445    W20289  09    00014490
1446    W20290  01    00014500
1447    W20290  03    00014510
1448    W20290  05    00014520
1449    W20290  07    00014530
1450    W20290  09    00014540
1451    W20291  01    00014550
1452    W20291  03    00014560
1453    W20291  05    00014570
1454    W20291  07    00014580
1455    W20291  09    00014590
1456    W20292  01    00014600
1457    W20292  03    00014610
1458    W20292  05    00014620
1459    W20292  07    00014630
1460    W20292  09    00014640
1461    W20293  01    00014650
1462    W20293  03    00014660
1463    W20293  06    00014670
1464    W20293  08    00014680
1465    W20293  10    00014690
1466    W20294  01    00014700
1467    W20294  03    00014710
1468    W20294  06    00014720
1469    W20294  08    00014730
1470    W20294  10    00014740
1471    W20295  01    00014750
1472    W20295        00014760
1473    W20295  04    00014770
1474    W20295  07    00014780
1475    W20295  10    00014790
1476    W20296  01    00014800
1477    W20296  04    00014810
1478    W20296  06    00014820
1479    W20296  08    00014830
1480    W20296  11    00014840
1481    W20297  01    00014850
1482    W20297  03    00014860
1483    W20297        00014870
1484    W20297  05    00014880
1485    W20297  07    00014890
1486    W20298  01    00014900
1487    W20298  03    00014910
1488    W20298  05    00014920
SYSIN
                     NEW MASTER
                                              IEBUPDTE LOG PAGE 0030
1489    W20298  07    00014930
1490    W20298  09    00014940
1491    W20299  01    00014950
1492    W20299  04    00014960
1493    W20299  06    00014970
1494    W20299  08    00014980
1495    W20299  10    00014990
1496    W20300  01    00015000
1497    W20300  03    00015010
1498    W20300  05    00015020
1499    W20300  07    00015030
1500    W20300  09    00015040
IEB818I HIGHEST CONDITION CODE WAS 00000000
IEB819I END OF JOB IEBUPDTE.

IEF142I - STEP WAS EXECUTED - COND CODE 0000
IEF285I   SYS75294.T144046.SV000.ZBPJDEXP.R0000001        SYSOUT
IEF285I   VOL SER NOS= M2SCR4.
IEF285I   SSA.INVENTRY                                    PASSED
IEF285I   VOL SER NOS= K3SCR2.
IEF285I   SYS75294.T144046.RV000.ZBPJDEXP.S0000002        SYSIN
IEF285I   VOL SER NOS= M2SCR1.
IEF285I   SYS75294.T144046.RV000.ZBPJDEXP.S0000002        DELETED
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W20001

orbit 1-5

11/15/71 - 11/16/71

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     0001 222222406120 200701111111 070212030107 202012121201 202020200701 202020030111 200202121103 121212202020
     0049 202020030111 200407021003 121212202020 616112121201 202020202020 202020202020 202020202020 202020202020
     0097 202020202020 202020202020 202020202020 202020202020
FILE 0002 REC 0001 CH 0120
     0001 000000002077 070100100203 000000000001 000000000477 000124231046 000000000477 000264276626 606005000231
     0049 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000 000000000000
     0097 000000000000 000000000000 000000000000 000000037262
FILE 0002 REC 0002 CH 7500
     0001 000000003400 000012425002 003000000000 000040000040 000000000000 400001000000 000000004000 014000000000
     0049 000040000200 000000000000 400002400000 000000004000 030000000000 000040000340 000000000000 600000000000
     0097 000012201121 443000000000 000027244436 000000000000 400004400000 000000004000 050000000000 000040000540
     0145 000000000000 400006000000 000000004000 064000000000 000040000700 000000000000 400007400000 000000006000
     0193 000000000000 004050040430 000000000000 400004400000 000000004000 050000000000 000040000540 000000000000
     0241 400006000000 000000004000 064000000000 000040000700 000000000000 400007400000 000000006000 000000000000
     0289 004011000000 000030026701 102700000000 700267411031 000000011002 700110330000 000130027041 103500000001
     0337 500271011107 400000017000 720110210000 000230005141 102300000002 500073011121 400000027000 520111254000
     0385 000320005241 112340000003 500053011011 000000041000 534110134000 000430004341 114500000004 600047011151
     0433 000000050000 440111530000 000520004441 115500000005 400045011157 000000056000 454111610000 000610005701
     0481 114700000006 300057411163 000000065000 600111650000 000670006041 114100000007 100046011143 000000073000
     0529 464110070000 000750003301 100700340007 700033411007 007000102000 430110410070 001040010501 104300700010
     0577 600105411045 007000110001 060110470070 001120010641 105100700011 400107011053 007000116001 074110150070
     0625 001210011001 105500700012 300110411057 007000125001 110110610070 001270011141 106300700013 100112011065
     0673 007000133001 124110670070 001350011301 101700700013 700113411007 012400142000 474110134160 001440005401
     0721 115101600014 700055011153 016000151000 554111550160 001530005601 115701600015 500056411141 016000157000
     0769 610111430160 001620006141 114501600016 400054411007 016000166000 500110070214 001700005041 100702500017
     0817 200051011007 030400174000 620110210340 001760007241 112143400020 100073411125 434000204000 740111234340
     0865 002070007441 101103400021 200075011013 434000214000 640111450340 002170006741 115103400022 200064411153
     0913 034000224000 650111550340 002260006541 115703400023 000066011161 034000232001 004111470340 002340010101
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     1057 300076411153 052000265000 770111550520 002670007741 115705200027 100100011141 052000273001 024111430520
     1105 002750010301 114505200027 700076011007 052000302000 704110070554 003040007101 100706100030 600071411007
     1153 064400310001 034111074700 003120014501 102107000031 500122411023 070000317001 460111214700 003220012301
     1201 112547000032 500123411123 470000330001 240110110700 003330012441 101347000033 500114411145 070000341001
     1249 200111510700 003430011501 115307000034 500115411155 070000347001 160111570700 003510011641 116107000035
     1297 300130011147 070000355001 304111630700 003570013101 116507000036 200131411141 070000364001 170111430700
     1345 003660011741 100707000037 000104011007 073400372001 044110070770 003740011401 104107700037 600160011043
     1393 077000403001 604110450770 004050016101 104707700040 700161411051 077000411001 620110530770 004130016241
     1441 101507700041 500163011055 077000417001 634110570770 004220016401 106107700042 400164411063 077000426001
     1489 650110650770 004300016541 106707700043 200166011017 077000434001 664110071024 004360012041 101350600044
     1537 100125011151 106000444001 260111531060 004460012641 115510600045 000127011157 106000452001 274111411060
     1585 004540013201 114310600045 600132411145 106000461001 254110071060 004630012101 100711140046 500121411007
     1633 115000467001 220110071204 004710013301 102112400047 300145411121 524000475001 464111255240 005010014701
     1681 112352400050 400147411011 124000507001 500110135240 005110013501 114512400051 400140411151 124000516001
     1729 354111531240 005210013601 115512400052 300136411157 124000525001 370111611240 005270015341 114712400053
     1777 100154011163 124000533001 544111651240 005350015501 114112400053 700137411143 124000542001 400110071240
     1825 005440013341 100712740054 600134011007 133000550001 344110071364 005520014101 101354200055 400150411151
     1873 142000557001 514111531420 005620015201 115514200056 400152411157 142000566001 530111411420 005700015541
     1921 114314200057 200156011145 142000574001 510110071420 005760014141 100714540060 100142011007 151000603001
     1969 424110071544 006050015641 100116000060 700413411003 160000611004 140110051600 006130041441 112756000061
     2017 500415011107 560000621002 160110211600 006240017541 102316000062 600217011121 560000630001 760111255600
     2065 006330017641 112356000063 600177011011 160000642001 774110135600 006440016741 114516000064 700173011151
     2113 160000651001 700111531600 006530017041 115516000065 500171011157 160000657001 714111611600 006620020301
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